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OF
AUSTRALIAN COAL

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THE ECONOMICS OF AUSTRALIAN COAL

ECONOMIC SERIES, NO. 7

THE ECONOMICS OF AUSTRALIAN COAL

BY

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Hunter River Valley, 1921-1925, Harbison-
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WITH AN INTRODUCTION BY

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To the Memory of
MY FATHER

AUTHOR'S ACKNOWLEDGMENT.

The gathering of the material which provides the basis of this book was first begun eight years ago with the author's introduction to the workings of the coal industry in the Hunter River district of New South Wales. A five years' residence in close proximity to coal mines and daily contact with those who live by mining was an experience which, he trusts, has prevented his wandering too far into a field of academic unrealities. He desires gratefully to acknowledge all the practical and expert assistance, so readily given by colliery proprietors, mine managers, officials of the Miners' Federation and other mine-workers' organisations, by officers of the Mines Departments, Statistical Bureaux, Railways and other Departments of the various States and the Commonwealth, by the Chairman and officers of the Victorian State Electricity Commission, by the General Manager of the Victorian State Coal Mine, and by numerous other individuals connected directly or indirectly with the coal industry, which may, with whatever success, have kept his feet to solid ground.

An acknowledgment of indebtedness is further due, and here made, to my friends, Mr. E. J. Ingram, B.Com., and Mr. G. A. Weller, B.Sc. (Econ.), B.Com., who have revised proofs, and to my wife for her assistance in the preparation of the index.

F.R.E.M.

INTRODUCTION.

A periodical survey of the condition of our staple industries would be of great value both to those engaged in industry and to those who seek an understanding of the trend of our economic organization. This book may be considered a good example of such a survey. We are witnessing the temporary paralysis of a great industry. The causes of this unfortunate condition are many and complex, but discussion of them has long been conducted in an atmosphere charged with suspicion and prejudice. The two main parties to the industry are unable to compose their differences, and the patchwork settlements of their relations in recent years have but served to widen the breach between them. Some of the forces contributing to the depression in the industry are beyond the control of either party, but little effort has been made to take them into account and to adjust the local factors which can be controlled to these external influences. Delay has increased the difficulties of a solution and the controversy between the two parties, sometimes extending to powerful outside groups ranged as contending forces on either side, has prevented a disinterested examination of the economic conditions of the industry. Yet, such an examination is a pre-requisite of the drastic reconstruction necessary to rehabilitate the industry. Mr. Mauldon has provided the public of Australia with just the information required for an understanding of the position. The book will probably please neither owners nor miners, but that may be regarded as a compliment to the author. He brings to the task an intimate knowledge of the industry, an impartial judgment and the courage of convictions reached only after long and dispassionate enquiry. Some of his conclusions may well be as distasteful to him as to the most extravagant partisan. As an Australian anxious to promote the economic development of his country, it cannot have been any pleasure to him to record, for the eyes of the world, a state of chaos in one of our leading industries. Very wisely he has avoided the futile attempt to apportion blame.

The task of the research worker is to analyse cause and effect, to lay bare the facts of the situation and to provide a basis for constructive criticism. Mr. Mauldon has shown conclusively that the economist can render this service to industry in no less measure than the pure scientist. His book will accordingly be welcomed by economists as a demonstration of the value of economic research. Australia is happily now extending its facilities for such research, but in most cases the responsibility has been left with Governments. Industry as a whole has not provided funds for this work. To a limited degree it has supported research in other fields, but in the economic sphere its efforts have been altogether inadequate. In neglecting for so long the economic forces that have threatened the prosperity of the coal mining industry, miners and owners alike have imposed upon themselves, and upon the country as a whole, losses far more serious than the cost involved in making such a survey as this book offers. Apart from the indirect gains that would accrue to the industry, why should it not be regarded as a public duty for any great industry to examine continuously, by the co-operative effort of all engaged in it, the basic economic factors determining its prosperity? In the coal industry it has been left to a private individual, at considerable expense to himself, to furnish Australia with the information necessary for an adequate appraisal of the economic forces at work. The industry has powerful associations of employers and employed; so powerful that they are able to indulge in prolonged industrial warfare, imposing heavy costs upon the community. A portion of the funds so spent could very profitably be devoted to the task of research. Mr. Mauldon shows clearly that a continuance of the present impasse must react harmfully upon both proprietors and workers. Whilst, therefore, his book is to be commended to the public generally, it is a direct challenge to those engaged in the industry to face the realities of the situation at once. The book contains suggestions for the immediate alleviation and ultimate solution of the very difficult problems that have arisen. Further delay will intensify these problems, and Mr. Mauldon's proposals cannot be dismissed as being of mere academic interest. His book is a practical guide to the solution of a great industrial problem as well as an important contribution to Australian economic literature.

D. B. COPLAND.

The University of Melbourne.
July 5th, 1929.

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CHAPTER I.

THE COAL QUESTION.

When Jevons, half a century back, for the first time applied an economist's critical mind to "the coal question," it was to drive home to a nation's consciousness the need for conserving a rich but wasting national asset. To-day the coal question means much more. It is concerned not so much with fears for the exhaustion of coal as for the social and economic consequences of its displacement. It is, indeed, even more concerned with the waste of human endeavour than with the waste of material resources. It is the *disorders* of a great and venerable industry which are to-day central to the whole question.

Since 1919 a chain of crises has been linking the coal-producing countries of the world in a common misfortune. East and west of the European storm centre the embarrassment that is coal has spread like a visitation. The tragedy of the British coal industry is but the most dramatic instance in which it has become manifest. Not only are all concerned for their livelihood from coal in other countries of the European coal belt—France, Belgium, Germany, Poland and Czechoslovakia—entangled in an instability which they have mutually created, but, in like condition, the producers on the coal fields of the United States and Canada to the west, no less than those of India and Japan to the east, are facing what is for some of them the most baffling and long-drawn-out crisis in their experience.

Over a decade when the demand of the world as a whole for coal has been relatively contracting, new coal resources have been tapped and new coal purveyors have crowded on to the market. Older resources and older purveyors have consequently suffered a most serious and embarrassing shortening of their custom. Furthermore, not only has this redistribution of supply relationships been an international phenomenon, but has had no less disturbing consequences within national boundaries.

The pre-war struggle for coal markets was never of the magnitude to which it has grown since 1919. Even so, it was not until 1928 that Australia was drawn, with critical results, into any major engagement in the "world war in coal." The coal industry of the Commonwealth, it is true, has not been immune from some losses of outposts, but, because of its antipodean isolation, it has enjoyed a strong natural protection of its home territory. Now, however, the defences are breaking down, perturbation has replaced disquiet, and what to Australians is a crisis of the first magnitude is upon the coal industry of the country.

The situation which has arisen calls not only for the expedients of a new line of defence, but for a thorough examination of the economic bases on which the coal industry in Australia depends. Australia needs the equipment of a fuller knowledge of her economic condition. This need is by no means confined to the question of coal. But inasmuch as the coal industry holds an outstandingly important strategic position in national affairs, the need of knowledge of what is implied in coal becomes imperative.

What are the essential elements which an understanding of the coal question in Australia involves? There is first the basic question of the country's resources in coal. Are they adequate, not only in the absolute sense of quantity available for present and future use, but in their variety, quality and accessibility? This is the economic question upon the answer to which depends much of the Commonwealth's power to maintain a comparative advantage in its trading relations with other countries. Closely bound up with it are all the implications of the methods of exploitation. Are the methods pursued such that they are winning the greatest net advantage to the country as a whole and to those most immediately dependent for their livelihood upon coal?

What, in other words, is the standard of performance in the coal industry?

Even this question cannot stand alone. The capacity for performance is conditioned by many circumstances. Some of these may be controllable, but others must be accepted as the given limitations of the game. To what extent, it may be asked, does the organisation of the industry itself facilitate or hinder a good performance? Obviously the answer depends first upon a grasp of the many-sided aspects of organisation and an understanding of the diverse needs and expectations which the existing structure has been built to satisfy. If examination of this structure should reveal defects which frustrate the accomplishment of desirable social and economic ends, how may they be remedied?

It is in the nature of a complex industry like coal that resolution of questions of this kind should first require the exploration of much factual material. The business organisation of the industry in Australia has been evolved for the profitable disposal of coal on both home and external markets. Only the most careful and patient examination of what has been happening in the flux of buying and selling on these markets can prepare the student of the affairs of coal for sound judgments. It is an exploration by no means without a fascinating interest. It will discover roads that lead right to those central problems which baffle and perplex.

Just what are the resources, what the ways of mining, what the organisation, and what the market adventures of Australian coal is the critical task of the first Part of this book to make clear. From this analysis, it is hoped, will be seen to emerge in greater clarity of outline the significance of the larger problems of the industry. Part II., following the method of descriptive analysis of Part I., will concentrate upon the elements in these problems. Part III. enters upon the challenging ground of "solutions." The author, in the light of his previous analysis, will offer a critical appraisement of a variety of proposals currently advanced for the rehabilitation of the industry, and, by himself suggesting an experimental solution, invite the fiery darts of other critics.

The wide scope over which the book proposes to range is a challenge to unified treatment and to the powers of the writer to sustain the reader's interest. It is inevitable that the very diversity of the questions discussed should involve unequal interest for an equally diverse body of readers. Thus for some the chapter which follows and examines the nature of coal resources and the distribution of working coal fields will lack the enlivening quality which they may discover in those that succeed. For the sake of logical treatment, however, no avoidance of the question of resources as an initial consideration seems possible. This apologetic note at the conclusion of an opening chapter may seem strange. Yet no real apology is needed for a plea for patient examination of *every* essential aspect of the puzzling question of coal.

PART I.

FOUNDATIONS AND STRUCTURE OF THE AUSTRALIAN COAL INDUSTRY.

CHAPTER II.

THE QUESTION OF RESOURCES.

I. THE COMMONWEALTH'S COAL RESOURCES.

The economics of any industry is rooted in the material resources at the industry's disposal. Coal is one of the few staple raw materials so essential to the modern world that a country not possessing or having access to it in abundance may find all its industries precariously founded. The question, then, of the raw material resources upon which the Australian coal industry is built is one of prime significance to Australia's industries as a whole.

The measure of a country's coal resources admits of no simple appraisal. The estimates of geologist, economic geographer, mining engineer, industrialist and economist will vary according to the relevancy, for the ends which each has in view, of the factors considered. All five are concerned with quantities, but not the same quantities. To the geologist it is a concession to arbitrariness even to limit an estimate to all black coal in seams of one foot or over to a depth of 6,000 feet. To the mining engineer, however, who knows how great a percentage of coal must be left underground in the process of extracting what is brought to the surface, every geological estimate of resources is a gross exaggeration.[1]

To the man preoccupied with problems in the commerce of coal—and he may be either geographer, industrialist, economist, or what not—coal that is unmineable, say, all below 4,000 feet, has virtually no significance. Moreover, estimates will differ according as quality, or what may properly or improperly be called coal, is considered in the count. The fuel which is known commercially as coal is, of course, no simple homogeneous substance. It is a variable made of variables—fixed carbon, volatile hydrocarbons, sulphur, oxygen, nitrogen, water and "ash"—whose permutations produce innumerable gradations of quality for industrial uses. Even the diversity suggested by the terms lignite (brown coal), sub-bituminous (black lignite), bituminous,[2] semi-bituminous, semi-anthracite and anthracite—a series of names indicating ascending proportions of fixed carbon—is as nothing, save as a useful classification in the multitude of variations known. Many of these gradations may offer little serviceableness to industry, and therefore be excluded from a commercial estimate of resources;[3] even though the same inadequacy be no cause for disqualification in the estimate of the geologist.

---

[1] Irretrievable losses underground, due to mining methods, may range from 35 to 60 per cent. of the coal available.

Further, for the sciences of the geographer and the economist, as for the purposes of merchant and the consumer, the regional distribution of coal resources is of the first importance. The geographical position of coal deposits in relation to the markets on which the coal is sold and used is a function of its accessibility, and therefore of its cost of production.

What, then, of Australia's resources in coal? In the first place, it should be emphasised that only the very roughest approximation to an estimate is permissible, despite the extent of geological surveys. In the second place, what estimates have been made by the Mines Departments of the several States are not strictly comparable and capable of summation in a total. In 1913 the Directors of Geological Surveys submitted estimates of the coal resources of their respective States to the International Geological Congress in Canada. As conditions governing knowledge of the resources of some of the States did not permit strict adherence to the classifications required by the Congress,[4] the totals for Australia finally estimated by that body were necessarily somewhat arbitrary. These totals in million tons were as follows:—

---

[2] More correctly humic. Bituminous coal contains no bitumen.

[3] This may also mean that great reserves of coal for some industrial purposes (say household), not accompanied by adequate reserves for more important purposes (say metallurgical), are discounted in an economic estimate. Cf. H. Foster Bain: "China's reserve is all the more important since it is only in that country that any considerable supply of coking coal is known in the Far East. Even so, the known fields of good coking coal are not numerous." ("Ores and Industry in the Far East," 1927, p. 54). By implication the 26 per cent. of the world's reserves of coal which lie in Asia are economically less important than the 17 per cent. lying within Europe.

	Actual Reserve.	Probable Reserve.	Total Reserve.
Black Coal ..	2,070	130,839	132,909
Lignites . ..	219	32,414	32,633
Totals	2,289	163,253	165,542

The totals given in Table I. of this chapter do not agree with those of the International calculations. Table I. has been constructed from the most recent official publications of the several Mines Departments, and includes some modifications of the estimates submitted to the 1913 Congress. The Table reveals the difficulty of accurate summation. The disparity between its totals and those set out above in the estimate of the compilers of the International Congress is due to the exclusion from the probable reserve, which the writer thinks should properly be made, of the as yet unverified estimate of 13,000 million tons in Queensland's possible reserve. The net effect of the exclusion, however, is to make little difference in the *magnitude* of the two summations. For all practical purposes it may then be assumed, in the light of present knowledge, that Australia possesses in mineable coal round about 130,000 million tons of black varieties, 30,000 million tons of lignites (mostly brown), or a total of 160,000 million tons.

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[4] The letter sent to Directors of Geological Surveys asked for three types of classification (see "Coal Resources of the World," Vol. I.):

(i.) Resources of coal grouped according as they are estimated to exist (a) in seams containing not less than one foot of merchantable coal occurring not more than 4,000 feet below the surface; (b) in seams containing not less than 2 feet of merchantable coal occurring not less than 4,000 feet and not more than 6,000 feet below the surface.

(ii.) Resources grouped according as they are (a) Actual Reserves calculated on a knowledge of the actual thickness and extent of the seams; (b) Probable Reserves of which approximate estimates only can be made; (c) Possible Reserves in which estimates in figures cannot be given.

(iii.) Resources grouped in the several Reserves according to four main types of coal, each embracing subdivisional types.

TABLE I.

COAL RESOURCES OF AUSTRALIA.

Approximate Conservative Estimate for Seams Not Less than One Foot Thick.

In Million Tons.

	Maximum Depth for Estimate.	Black Coal.				Brown Coal including Sub-bituminous.	
		Actual.	Probable.	Possible.	General Quality of Actual Black Coal Reserve.	Probable.	Possible.
New South Wales	4,000 ft.	20,000[1]	100,000	Large	Nearly one-third high grade	No Estimate	
Queensland	1,000 ft.	410	2,130	Large[2]	Nine-tenths high grade	70	Very large
Western Australia	2,000 ft.	3,500 (Not reliable)			Mostly medium to low grade	—	—
Tasmania	4,000 ft.	125	123	Fairly large	Mostly medium grade	No Estimate	
Victoria	4,000 ft.	20	Probably little		Mostly high grade	30,000	No Estimate
South Australia	4,000 ft.	—	—	—	—	53	Large
North. Territory and Papua	—	No Estimate				No Estimate	
COMMONWEALTH ..	—	126,308		—	—	30,123	—
		Approximate Total of Actual and Probable Reserves of All Coal, 156,431					

[1] Inclusive of small portion of Probable Reserve.

[2] 13,000 by Dunstan Min. Index, 1913.

TABLE II.

AUSTRALIA'S SHARE OF THE WORLD'S COAL RESOURCES.

RESOURCES. (Million Tons and % of World Totals.)	BLACK COAL.		LIGNITES.		TOTAL RESOURCES. (Converted into Black Coal.[1])	
	Tons.	%.	Tons.	%.	Tons.	%.
German Reich[2]	235,347	5.4	13,353	0.4	240,715	4.3
Great Britain	189,533	4.3	—	—	189,533	3.4
Russia[6]	56,459	1.3	1,633	0.1	57,115	1.0
France[3]	31,750	0.7	1,632	0.1	32,406	0.6
Rest of Europe	245,907[4]	5.5	23,632	0.8	255,408[5]	4.5
EUROPE	758,996	17.2	40,250	1.4	775,177	13.8
United States	1,986,408	44.9	1,863,479	62.1	2,735,527	48.6
Canada	285,819	6.5	948,450	31.6	667,095	11.9
Rest of America	32,598	0.7	4	—	32,580	0.5
THE AMERICAS	2,304,825	52.1	2,811,933	93.7	3,435,202	61.0
Japan	7,246	0.2	805	0.0	7,570	0.1
British India	76,399	1.7	2,602	0.1	77,445	1.4
China	994,987	22.5	600	0.0	995,228	17.7
Siberia	66,035	1.5	107,844	3.6	109,388	2.0
Rest of Asia	23,068	0.5	—	—	23,068	0.4
ASIA	1,167,735	26.4	111,851	3.7	1,212,699	21.6
Australia	*132,909*	*2.97*	*32,633*	*1.08*	*145,962*	*2.56*
New Zealand	911	.02	2,475	0.8	1,901	.03
Rest of Oceania	320	.01	7,122	.04	846	.01
OCEANIA	134,140	3.0	36,240	1.2	148,709	2.6
AFRICA	56,785	1.3	1,054	0.0	57,229	1.0
WORLD TOTALS	4,422,481	100	3,001,328	100	5,629,016	100

[1] On the basis of 2½ tons lignite=1 ton black coal.

[2] Excluding Saar District, the Palatinate, Lorraine, and East-Upper Silesia.

[3] Including Lorraine and Saar District.

[4] Including Poland and East-Upper Silesia, accounting for 208,650 million tons, *i.e.*, 4.7 % of world totals.

[5] Including Poland, accounting for 210,097 million tons, *i.e.*, 3.8 % of world totals.

[6] According to the most recent Russian statements the total resources of coal (converted into standard fuel of 7,000 calories) in European Russia amounted to 64,099 million tons, in Asiatic Russia to 329,779 million tons, and in the U.S.S.R. to 393,878 million tons.

If this total of 160,000 million tons be taken as the potentially workable supply in the Commonwealth, and at least one-third be deducted for working losses, there remain possibly 100,000 million tons of coal, good, bad and indifferent, from which to draw. Professor Sir T. W. Edgeworth David, the eminent Australian geologist, would use the round figure of 70,000 million tons for economic estimates.[4a] At the present rate of extraction this supply could conceivably last from 4,000 to 5,000 years.[5]

In terms of the geological mode of estimation, Australia possesses about one-fortieth of the world's resources of coal. The Commonwealth's heritage in relation to that of other countries is indicated in Table II., based on the calculations of the International Congress.[6] No single country in the Southern hemisphere is endowed with greater coal resources; nor, indeed, do the combined deposits of Africa, South America, New Zealand and the rest of Oceania reach the magnitude of those of Australia. Only one country of the Western Pacific, China, has reserves which probably overshadow those of the Commonwealth.[7]

[4a] It is possible, states Sir T. W. E. David, that this estimated figure will have to be reduced considerably in the light of the theory enunciated by J. M. Morris, Esq., who has conducted extensive boring operations for the B.H.P. Collieries Ltd., that only an outer ring, some 25 miles wide, of the coal basin marked by the outcrop of the Greta measure on the Maitland field of N.S.W. contains coal of economic significance. The recent boring operations indicate that the Greta coal seam towards the centre of the basin degenerates into a shaly substance. The assumption hitherto has been that the same quality of coal would be found throughout the whole extent of the basin.

[5] The estimated reserve of the United States (3,838,657 million tons, by Dr. H. Foster Bain, Director of U.S. Bureau of Mines) could last at the present rate of American consumption 5,800 years. The per capita consumption of coal in U.S.A. is more than twice that in Australia.

[6] And adapted from a table in the excellent "Economic Forces of the World" publication (1927) of the Dresdner Bank, Berlin.

[7] Considerable doubt has recently been thrown on the estimate for China submitted to the International Congress in 1913 by N. F. Drake. The latest estimate (1924), that of W. H. Wong, the present Director of the Chinese Geological Survey, brings the probable (including the "actual") reserve to as low as 23,435 million tons, which, if correct, is less by about 11,000 million tons than the combined actual and probable reserves (exclusive of possible reserves) of Australia. By taking account of very thin seams and mining to depths below 3,000 feet, Wong was willing to concede not more than 40,000 to 50,000 million

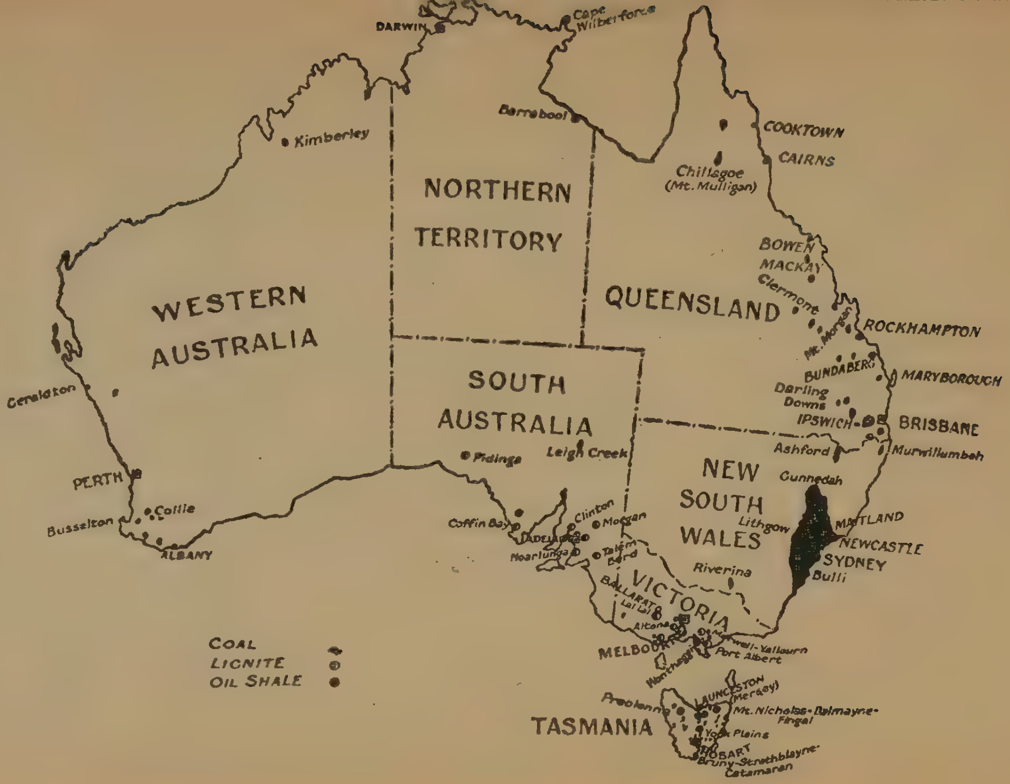

Figure I.—The Coal, Lignite and Shale-Oil Deposits of Australia.

The importance of the regional distribution of Australian coal resources will be considered in the following section, which discusses their exploitation by working coal fields. It will suffice here to emphasise the inequality of the distribution. Three-quarters of the total reserves lie within the borders of New South Wales beneath a belt of country of approximately 16,550 square miles. The farthest inland point[8] of the belt is not more than 150 miles in a direct line from the sea, the tract itself enjoying the geographical advantage of 160 miles of coastline.[9] All the fuel deposits in this great basin belong to the permian coal measures. These measures have also revealed their coal content in three other small isolated basins, two of them[10] in inland situations remote from the sea, while an inferior coal[11] of the triassic measures has been found in the coastal country in the extreme north-eastern corner of the State. Almost one-third of the actual reserve of New South Wales is estimated to be of the best of the three grades into which the State Geological Survey divides the coals, and about one-quarter of the second grade.[12]

The remaining quarter of Australia's coal deposits are unequally divided among the other States. Queensland possesses proved deposits in cretaceous coal measures in a quadrangular area of about 20,000 square miles in the

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tons as "a good figure for the total Chinese resources." Assuming this estimate to be reliable, it would mean that China could supply herself and her customers at the present rate of consumption of Chinese coal for 2,000 years. But on a presumption that the Far East is destined to become industrialised in the Western sense, these resources could last only 16 years if the per capita rate of consumption of the United States were ever applied to the population of China alone. If Drake's estimate is nearer the truth, the Chinese reserve could serve the Chinese people at the American per capita rate of consumption, some 346 years as compared with the 5,800 years during which American reserves, at the present rate of consumption, would be available to the Americans, and with the 306 years during which Australian reserves, at the American per capita consumption rate, would be available to Australians. See H. Foster Bain: "Ores and Industry in the Far East" (1927), pp. 41-47 and 208.

[8] Dubbo.

[9] From the Shoalhaven River to Port Stephens.

[10] At the head of the Clyde River, at Ashford (near Queensland border), and at Oaklands in the Riverina (near Victorian border).

[11] The Moonem and other deposits in the Richmond-Tweed district.

[12] "The Coal Resources of N.S.W.," Bulletin No. 6 (1925) of the Department of Mines N.S.W. Grade A coals with ash from 5 to 12 per cent are suitable for steam raising, gas-making and household purposes; Grade B coals with ash from 12 to 20 per cent., with lower calorific value, but suitable for use in the condition as mined; Grade C coals from seams of inferior quality, but suitable for use after washing or flotation.

west central part of the State, in trias-jura measures of upwards of 22,000 square miles, divided about equally between coastal and inland regions, and in permian measures stretching westerly in large patches from the seaboard over a total area of about 30,000 square miles. Important as the possibly workable deposits are, the considerable totals of superficies area mentioned exaggerate their significance in relation to the concentrated stores in the smaller coal-bearing areas of New South Wales. In the present stage of Australia's industrial development Queensland is hindered rather than helped by the scattered locations of her workable deposits, even though the coals are nearly all of high grade, some of the semi-anthracites in particular being noted for their excellent steam-raising qualities. Most of Queensland's coal is bituminous, but the State also possesses large reserves of semi-bituminous coals and lignites.[13]

No approximately accurate knowledge is yet to be had of the total reserves of Western Australia, although it is probable that they far exceed those of Tasmania, Victoria and South Australia combined. Western Australia's eight distinguishable deposits range in age from the oldest carboniferous to the most recent post-tertiary, and, except for that in the Kimberley Division of the far north, are confined to the south-west portion of the State.[14] No attempt has been made to estimate the reserves represented by these deposits, except for the Collie field, in which it has been doubtfully claimed there may be 3,500 million tons available.[15] Despite relatively inferior quality, as will be shown in the following section, Western Australian coal is being vigorously exploited.

The greater part of Tasmania's coal resources lies in the eastern and south-eastern districts of the island. The most important deposits of sub-anthracites and non-cok-

[13] The only known deposit of brown coal is 34 miles N.N.E. of the port of Rockhampton. "The quality of the coal is undoubtedly good, but beyond some preliminary boring operations no attempt has been made to develop the seam of clean coal, which is known to be 52 feet thick."—"Coal Resources of Queensland," Publication No. 239 of the Department of Mines.

[14] A. Gibb-Maitland: "The Coal Deposits of Western Australia," in the Mining Hand Book of the Department of Mines.

[15] Report of the Royal Commission on the Collie Coal Industry, 1914, p. ix.

ing bituminous coals belong to the trias-jura measures, though highly valued fuels of the same types, as well as kerogenites and humic-kerogenites,[16] are found also in the permian system. Brown coals and lignites are confined to beds of the tertiary age. It will be left to the next section to discuss the economic significance of the Tasmanian coals.

Victoria, as compared with Tasmania in total and variety of black coal resources, though not of brown, is relatively poorly equipped. The jurassic coal, of unequal accessibility and quality in the three known areas,[17] totalling some 3,500 square miles in the southern belt of the State, may possibly last another forty years. Extensive exploration of these fields by scout bores has encouraged no hopes of finding further workable deposits.

In brown coal, however, the State has been notably endowed, both in quantity and quality. Deposits of tertiary age lie adjacent to and within a hundred miles to the east and west of Melbourne. The most important are those of the Latrobe Valley and of Port Albert area in the east, for in these two localities are very thick beds with relatively shallow overburden of covering material. In the Latrobe Valley is to be found the largest single deposit of brown coal in the world. It occupies a probable area of 600 square miles, of which 150 square miles have been proved to contain coal.[18] The coal in several localities has been proved by boring to be of extraordinary thickness, ranging from 480 to 780 feet at a depth of from 30 to 40 feet;[19] and even at Yallourn, where the deposit is at present being cut on an extensive scale, the

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16. Kerosene shale, pelionite, tasmanite, etc. See the excellent official publication, "The Coal Resources of Tasmania," of the Geological Survey, Department of Mines' Mineral Resources, No. 7.

17. South Gippsland, Otway and Wannon. In South Gippsland alone are seams of payable thickness at present known. See H. Herman: "The Economic Geology and Mineral Resources of Victoria," Bulletin, No. 34, Department of Mines.

18. H. Herman: "The Brown Coals of Victoria," Bulletin, No. 45 of the Department of Mines.

19. "Deep brown coal is a matter of academic interest for the present generation; but it will probably furnish a wealth of energy for centuries to come. Seams 100 feet to 200 feet thick, with overburden less than 100 feet thick, are the treasures of the present generation, especially when near a generous water supply."—"Report of the Advisory Committee on Brown Coal," 1917, Appendix A.

thickness varies from 120 to 180 feet, averaging 150 feet, with an overburden of from 20 to 40 feet, or an average of 28 feet. The Port Albert deposits occupy a probable area of 200 square miles, of which 40 square miles are known to be coal bearing. In parts these deposits are of from 120 to 193 feet thickness, and, with overburden of from 30 to 45 feet only,[20] will possibly in the future lend themselves to the "open cut" method of winning fuel for the use of electro-chemical and other industries, which could be served with sea transport from the neighbouring Port Welshpool.[21] The Altona deposits, in an area somewhere between 20 and 200 square miles in extent, have a location advantage in being but a few miles from Melbourne, but, although ranging in thickness from 14 to 140 feet, are nowhere less than 242 feet underground. The lesser deposits to the west would almost all require deep-mining methods of extraction.

It will thus be seen that Victoria's brown coal reserves serve in some measure to compensate for the insufficiency of black coals. Actually, Victoria's reserves of lignites are in general quality equal to the best mined anywhere, and in quantity are greater than the reserves of any single country of Europe, Africa and Asia, with the exception of Siberia.

South Australia's resources are all "young" coals, that is, they are either triassic sub-bituminous or tertiary brown coal deposits. No estimate of the former in the one field known[22] is yet possible, but the reserves in the five localities[23] containing the latter have been "proved" by boring to be about 53 million tons. The principal sub-bituminous seam attains a thickness of over 47 feet, but lies at a depth of from 100 to 1,500 feet—conditions which, together with its geographical situation, render it of questionable commercial value for years to come. As will be shown in the section to follow, most of the brown coal deposits, while not of greatly inferior quality, are thin in relation to those of Victoria, and have too great a thickness of overburden to permit profitable "open cut" mining.

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[20] Report, p. 27.

[21] Herman, op. cit., p. 19.

[22] Leigh Creek, 163 miles from the nearest port.

[23] Moorlands (8,175,000), Bower (1,800,000), Inkerman (10,000,000), Clinton (32,000,000) and Noarlunga (1,438,000). All these deposits are under 100 miles from Adelaide. See H. Herman: "Report on the Brown Coals of South Australia," 1925.

Of the Northern Territory and Papua little need be said. No black coal deposits have been found in either region, though tertiary lignite of a maximum thickness of 2 ft. 9 ins. has been found on the watershed of the Upper Purari River and in the upper channels of Curnick River in Papua, and another deposit in the vicinity of Astrolabe Bay.[24]

In an economic survey of the coal resources of the Commonwealth some reference should be made to those near-coals or cannels[25] known variously as kerogenite or "kerosene shale," torbanite, pelionite and tasmanite. They are estimated to exist in fairly large quantities in the Preolenna and Barn Bluff areas in the north-west of Tasmania, and in very large quantities more particularly in the Capertee-Wolgan-Glen Alice area, 88 miles westerly of Sydney, and the Murrurundi-Baerami district, 115 to 120 miles north-west of Newcastle in New South Wales. The kerosene shale[26] deposits of the latter State have been estimated by the late R. H. Cambage, former Under-Secretary for Mines, to be approximately 40,000,000 tons, containing 3,500 million gallons of crude oil.

II. The Working Coal Fields of Australia.

The total coal resources of a country are just an aggregate of possibilities. It is selection from these possibilities, by the process of trial and error, that constitutes the coal industry and its economic problems. Only those patches in the whole scope of resources which offer the promise of immediate utility will invite exploitation. Thus in Australia, as elsewhere, there are far fewer working coal fields, as the industrialist understands the term, than there are coal fields as understood by the geologist. A geological enumeration of coal fields will embrace more than those even potentially workable.[27]

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[24] Quoted from reports of J. E. Carne and E. R. Stanley, by the late R. H. Cambage, in his Presidential Address to the Royal Society of N.S.W., 1924.

[25] Generally classified as (i) brown cannel, of which "kerosene shale" is the most notable type, with high ratio of volatiles to fixed carbon and low ash; (ii) black cannel with equal percentages of volatiles and fixed carbon, with ash medium to high; and (iii) shaly cannel, with equal percentages of volatiles and fixed carbon, ash very high. Cambage, op. cit., pp. 41-42.

[26] 'This substance occurs more extensively in N.S.W. than perhaps in any other part of the world. It is found in the Upper and Lower coal measures, but the more extensive deposits occur in the former formation." C. A. Sussmilch: "The Geology of New South Wales," p. 95.

Because of the irregular distribution of Australian coal deposits, the working and practically workable fields, as might be expected, are, in their total, widely scattered. In New South Wales alone is there a regional concentration of collieries comparable to that of the "coal lands" of Europe and America. In other States workable deposits are dotted at wide distances over the country, and of these not more than half are as yet the centres of any productive mining.[28]

The term coal field is ambiguous in another sense. It is frequently used interchangeably with the terms coal district and coal area. There is little uniformity of meaning in each of the three expressions, even as used in the official publications of the Mines Departments of the various States. In New South Wales, Queensland and Tasmania a coal district ordinarily describes a wide regional aggregation of collieries which are themselves grouped either geographically or geologically, or in both ways, in coal fields or coal areas. In Victoria and Western Australia, district, field and area have little distinguishable meaning. All this lack of uniformity in terminology, comparable, if in lesser degree, to the confusion in the language of mining itself, is a handicap but no insuperable difficulty in an analysis of the economic realities underlying the operations of the coal industry. For the purposes of this enquiry we shall regard a coal area as a subdivisional part of a working coal field and a coal field similarly a part of a coal district, where such divisions are warranted at all.

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[27] The distinction between coal measures and coal fields is sufficiently obvious, the former referring to systems or series of strata believed to include coal seams, the latter to areas proved to contain coal seams, whether workable or unworkable. Thus, for instance, the geographically surveyed coal measures of Queensland are estimated to lie within a superficies area of 73,000 square miles, of which 20,000 square miles, although containing much unworkable coal, are described as proven "coal fields."

[28] See Coal, Lignite and Oil-shale Map of Australia (Figure I).

The relative importance of working districts, fields and areas may be measured by their annual output of coal. The average annual tonnage of black coal mined from all Australian collieries in the ten-year period 1917 to 1926 inclusive was 13,071,000 tons.[29] To this quantitative measure of the economic importance of the Commonwealth's total black coal output (modest though it be in relation to that of other countries) should be added the output of brown coal of Victoria, which, since the inauguration of the State Electricity Scheme in 1919, has reached (in 1927) an annual total of 1,455,000 tons.

In what proportion is this total tonnage output spread among the coal fields of the Commonwealth? New South Wales is predominantly the black coal producing State, being the source of 83 per cent. of the whole Australian production and a supplier of all other States. Three important districts, Northern, Southern and Western, are distinguished, their importance being indicated in the order in which they are named.[30] In 1927 153 collieries were operating in the three districts, and of these 140 had outputs ranging from less than 100 to just over 500,000 tons. The collieries of the Northern district are usually grouped into seven working coal fields—the Newcastle (including Teralba and Wallarah areas), East Maitland (or Tomago), South Maitland, Greta, Rix's Creek, Muswellbrook and Gunnedah-Curlewis—though it is equally common to distinguish them by the main seams upon which they operate.[31] The largest collieries, with daily outputs exceeding 2,000 tons, work on the Greta seam in the South Maitland field. Geographically collieries in the Northern district range along railway

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[29] Ranging between limits of 12,200,000 (1922) and 13,757,000 (1924).

[30] The output of each was, in 1927, Northern 7,145,000, Southern 2,155,000, Western 1,825,000, or a total of 11,126,000 tons.

[31] These seams, and the percentages of the total output of the Northern district which they contributed in 1927, are as follows: Greta (mainly Maitland field) 69, Borehole (Newcastle field) 17, Victoria Tunnel or Burwood 4.8, Great Northern 3.8, Wallarah 2.3, Gunnedah and Curlewis 1.6, Australasian .8, Four-mile Creek or Tomago .5, Rix's Creek .007. For details of the relations of seams to fields see Mauldon: "A Study in Social Economics: The Hunter River Valley," Ch. V.

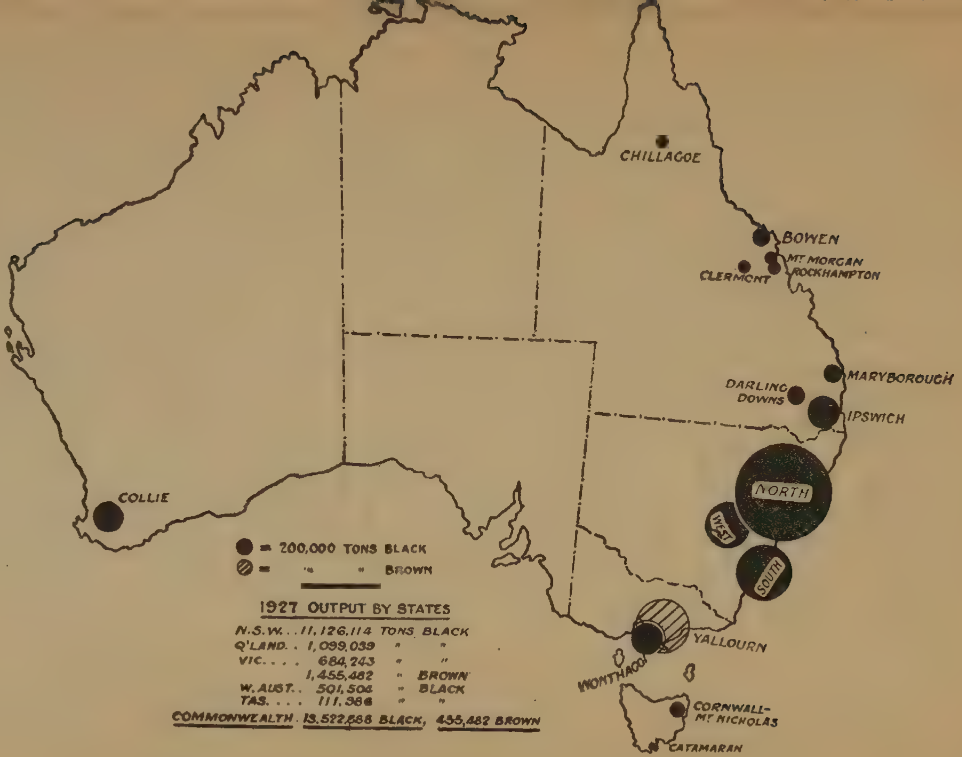

Figure II.—Distribution of Coal Production in Australia, 1927.

routes[32] up to nearly 200 miles from the port of Newcastle, though the majority lie well within 40 miles of the seaboard. The Southern district collieries,[33] some of which are of a size comparable with those of the South Maitland field, all work on the same seam, the Bulli. They are, however, divided into two groups, a northern, ranging from 30 to 45 miles from Sydney and enjoying advantages in short rail transport, a considerable share of railway coal contracts, and a small general trade in the metropolis, and a southern, ranging from 48 to 61 miles from the capital, dependent upon sea carriage and a trade governed thereby. In the Western district, where again a single seam (the Lithgow) engages serious attention, collieries are in two well-defined groups, one under 100 miles and the other between 106 and 118 miles from Sydney. The mines are smaller than those of the Northern and Southern fields and, despite a not inconsiderable demand by the metal industry of Lithgow and by cement works further west, find the advantage of cheaper working offset by a heavy rail haulage to Sydney. They are dependent very largely on railway contracts for large coal, and, for the disposal of small, upon city powerhouse and railway electricity requirements.

Queensland ranks second among the coal-producing States, but accounts for only 8 per cent. of the national production. In comparison with the remaining States to be considered, however, the potentialities of Queensland in extractable coal are very great. The ten coal districts into which the State is divided, and over which 71 collieries were operating in 1927, are of widely differing importance in output.[34] Their total annual production is not yet equal to that of the smallest district (the Western) of New South Wales. The fields and collieries are widely scattered. Eighty-five per cent. of the coal mined comes from fields within 50 miles of a seaport, most of it from the Ipswich district in the south-east corner of the State. Other coastwise working fields are distributed at convenient distances along the seaboard. But not the least important of the fields, the Clermont, with a 66 ft. seam of excellent steaming quality, is worked not less than 240 miles from the coast. It will be thus seen that the natural decentralisation of coal resources in Queensland has already induced a widely scattered coal industry. So far it has been the richer beds of the permo-carboniferous in the south-east and the trias-jura measures in the east central portions of the State which have been tapped. It remains for the remoter future to test the possibilities of the resources of the cretaceous measures, the strata of which stretch in a belt from the Gulf of Carpentaria through Western Queensland to the southern and south-western borders of the State. In that remoter future, when the population of Australia will be nearing its point of optimum size and density, Queensland will probably afford a wider diversity of industrial activity than any other State of the Commonwealth.

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[32] Those of the Wallarah area, being on the seaboard, are an exception.

[33] Among which may be included the Balmain colliery of the Sydney Harbour Collieries Ltd., which at a depth of 2,900 feet is working on a northern extension of the Bulli seam (6 ft. 9 in. thick).

[34] The total tonnage output of each of the ten districts with number of collieries operating (in brackets) in 1927 was as follows:—Ipswich 612,887 (41), Bowen 125,844 (2), Darling Downs 105,789 (8), Maryborough 96,345 (9), Rockhampton 50,429 (2), Clermont 49,437 (4), Mount Morgan 37,890 (2), Chillagoe 20,063 (1), Mackay 300 (1), and Bundaberg 55 (1). Total 1,099,039 (71).

In terms of present coal output, though not of resources, Victoria occupies third place among the States. Yet its share of the Commonwealth's total production of black coal is only between 4 and 5 per cent. Victoria is distinguished, however, as before noted, by the development of its excellent brown lignites.[35] This State is further distinguished from the others by the predominant part taken by Government as coal entrepreneur. Of the output of the only black coal country yet to be worked (South Gippsland), on which about 16 collieries are operating, 89 per cent. is the product of the State Mine[36] at Wonthaggi, the remainder that of a dozen small

[35] The output of black coal for 1927 was 684,245 tons, valued at £762,530, that of brown coal, 1,455,482, valued at £220,003. On the assumption that from 3 to 4 tons of Yallourn brown coal have the effective equivalence of 1 ton of Wonthaggi black coal, the total output of brown coal may be expressed in terms of from 364,000 to 463,000 tons of black coal—a quantity equal to from a half to two-thirds of the output of the black coal mines of the State.

[36] Comprising five pits in 1927.

private enterprises. The three private companies nibbling at the brown coal resources of Morwell, Yan Yan Gurt, and Lal Lal respectively, produce but a negligible amount in comparison with the annually increasing tonnage of brown coal quarried from the Old and New Open Cuts[37] of the State Electricity Commission at Morwell and Yallourn. The black and brown coal industries of Victoria are thus almost entirely State businesses.

The working fields of neither black nor brown coal in Victoria are situated conveniently to suitable seaports, despite the coastal location of the Wonthaggi and neighbouring mines on the edge of Bass Strait and the relative proximity to the same seaboard of Yallourn and Morwell. The consequent rail haulage involved of from 80 to 100 miles to Melbourne[38] has proved, together with the difficulties of a peculiarly faulted field, thin seams and relatively inferior coals, no light handicap to the Victorian black coal industry in competition with that of N.S.W. on the industrial market of its own State; as it has, of course, proved of still greater hindrance in inducing a direct consumption of the less valuable brown coal, either in its native wet, its partially dried or its pulverised form under the boilers of manufacturing plants. Almost the entire output of black coal from the State Mine is sold to the Government Railways and public Departments.[39] Victoria's industries still consume about two and a half times as much N.S.W. as local coals. Of the brown coal won at Morwell and Yallourn not quite a third[40] is converted into briquettes sold on the industrial market throughout Victoria, but the greater part is

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[37] The adjoining deposits at Yallourn worked by the Commission. Old Cut brown coal contains 48 per cent. of moisture, New Cut, 65 per cent., as hewn, but averaging 63 per cent., through natural drying, as delivered to the Power House.

[38] From Melbourne, Wonthaggi is 83 miles by rail; Morwell and Yallourn, 97.

[39] For the year ending 30th June, 1928:

To Railway Department	489,652 tons
To Public Departments	18,872 tons
To General Public	74,216 tons

[40] 28 per cent. for year ending 30th June, 1928:

Delivered to Power House:	New Cut	753,825 tons
	Old Cut	475,888 tons
Delivered to Briquette Factory:	New Cut (only)	473,735 tons
	Total	1,703,448 tons

consumed on the spot in the generating of electrical power.

As a coal-producing State, Western Australia, although it has not one-quarter of the population, lags very little behind the much more industrialised Victoria and is far less dependent upon N.S.W. coals. As indicated earlier in this chapter, the western State possesses eight distinguishable coal deposits, six of them, including the most important (the Collie), concentrated in the south-western corner. The Collie, however, is as yet the only working coal field. The seven collieries operating are responsible for about 3½ per cent. of the national production. Relatively to the vast hinterland of the State. the field may be regarded as enjoying a coastal location, although separated from Fremantle (*via* Perth) by 136 miles, from Bunbury by 41 miles, and from Albany by 270 miles, to all of which ports it is connected by rail. Moreover, the handicap of rail haulage is offset by two compensations. The first is the natural protection which a long sea route provides against a too easy invasion into Western Australia of competitive New South Wales coals; so that the State is able to engage in even an export trade in bunkers. The second is the assured market given by the State Government Railways[41] and Tramways and by the Government Electricity Supply, which together consume 70 per cent. of the Collie output; so that the dependence of the West upon New South Wales supplies is decreasing rather than increasing.[42]

The significance of the coal industry of Tasmania is not entirely to be measured by its diminutive share in the total production of the Commonwealth, to which it contributes under one per cent.[43] Tasmania imports from New South Wales more coal than it produces.[44] This fact indicates that the island State's resources of black

41. The Commonwealth Government's trans-continental railway system, of which 454 miles lie within Western Australia, uses only Maitland (N.S.W.) coal.

42. Exports of coal from Newcastle (N.S.W.) to Western Australia have fallen from 183,597 tons in 1921 to 76,266 tons in 1927. The consumption of N.S.W. coals by the Western Australian Railways and Tramways, and the Electricity Supply has not exceeded 11,000 tons for a number of years, and, compared with the consumption of local coals, shows no sign of increasing.

43. The output of Tasmanian mines in 1927 was only 102,218 tons.

44. 114,677 tons in 1927.

coal, greater as they are in the aggregate than those of Victoria, are not adequately suited to all existing industrial demands. But the same fact hides rather than reveals the adverse operation of the law of comparative costs, which weights the whole industrial life of Tasmania.[45]

Tasmania's resources in coal, as in other natural gifts,[46] are not great relatively to those of the Australian mainland, and must await for their full economic exploitation the time when increasing costs and diminishing returns on the continent itself combine to turn the attention of the industrialist to what Tasmania has then to offer.

The industrial history of Tasmania is strewn with valiant but futile attempts to defeat the law of comparative costs. Only two of the nineteen distinct and widely scattered coal fields[47] of the island have not at any time heard the ring of the miner's pick. To-day, however, not more than six are receiving any attention at all and four only are producing coal. In terms of present production the Mount Nicholas-Dalmayne-Fingal field on the north-east coast, with its three collieries, is of most account, though the quality rather than the existing volume of output of the Catamaran field, at the southernmost point of the island, is of no less significance. Of the remaining "working" fields, those of the Mersey (a coast-wise field in the north) and York Plains (an inland field between Launceston and Hobart) produce but a few hundred tons annually, while those of Preolenna (in the mountainous north-west), Avoca and Seymour (both in the vicinity of the Mt. Nicholas field in the north-east) are as yet only in the stage of development. No attempt has yet been made to exploit for fuel purposes the scattered deposits of brown coals and lignites in the west and north-west coasts and in the valleys of the Derwent and Tamar; and with the impossibility of economically working any locality by open-cut methods with anything less than 20 feet of overburden to remove, these low-grade fuel resources of the island must be classed among the more remote of future possibilities.[48]

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[45] The problem for Tasmania is largely one of relative costs of transport, both internal and external. The net cost of providing inland transport facilities is £3/10/- per head per year more than on the mainland. The population's economic dependence on high-cost shipping is indicated in the fact that the per capita tonnage and value per ton is greater than the average for Australia. See Brigden: "Tasmania: An Economic Sketch."

[46] "Tasmania's resources have not been specially appropriate (to manufacturing industries), and, in fact, the island produces only half of the manufacturing value of Victoria (per capita), and three-fifths of that for the whole of Australia."—Brigden, ibid.

[47] The larger fields being subdivided by the Mines Department into at least thirty "coal areas."

It has not yet been possible to build a coal mining industry upon the sub-bituminous and brown deposits of South Australia, despite their not inconsiderable dimensions. The cost disadvantages of exploiting these indigenous resources have been too obvious. South Australia is not a highly industrialised State, but the total quantity of black coal annually either consumed within or passing through its borders falls little short of a million tons. Had it been reasonably possible to serve this market from local resources, no opportunity would have been lost of doing so. But careful investigations[49] into the economics of the situation have shown the costs to be too high. Relatively low-grade quality and geographical position render unfavourable the exploitation of the most important deposit of sub-bituminous coal (at Leigh Creek, by rail 373 miles from Adelaide and 163 miles from Port Augusta). The necessity for deep mining makes only somewhat less unfavourable the working of the three most promising deposits of brown coal (at Moorlands, Inkerman and Clinton, the two former 87 and 58 miles by rail, the latter 55 miles by sea, from Adelaide), despite a not greatly inferior quality as compared with Victorian lignite.[50]

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[48] "The Coal Resources of Tasmania," Ch. XX.

[49] By officers of the Department of Mines, by the Leigh Creek Coal Committee, and by Dr. H. Herman, Engineer-in-Charge of Briquetting and Research, State Electricity Commission of Victoria.

[50] Dr. Herman, in his "Report on the Brown Coals of South Australia and Prospects of their Commercial Utilisation," 1925, suggested the possibility, if no better alternative should be found, of a power station placed on deep brown coal, costing 10/- per ton to mine (say in the Port Wakefield area, containing the Clinton and Inkerman seams), with transmission of electrical energy to Adelaide, at a combined cost at Adelaide comparable with existing costs of generation at Port Adelaide with Newcastle coal and transmission to Adelaide. Such a station was suggested, not as offering greater economies than a station at Port Adelaide using Newcastle coal, but "as a means of lessening the dependence of the State on imported fuel, of developing and utilising the indigenous fuel resources of the State, and of providing for the supply of electricity to many country towns and districts which otherwise might not be enabled to enjoy the advantages of the uses of electrification for an indefinite period." Following his recommendation of an active scout boring campaign, the Mines Department is continuing its search for shallow lignites. (See "1927 Report of Director of Mines" and "Mining Reviews," No. 46 and 47.)

The foregoing brief descriptions of the coal resources and of the distribution of present activities upon them will provide the starting point for the wider and more detailed exposition of economic considerations in the following chapters. This chapter may fitly close with a few pertinent observations upon the economic significance of resources.

The possession of from 70,000 to 100,000 million tons of coal for potential use has little relevance to existing problems of exploitation. The fact, however, that such resources are unequally scattered over a large continent occupied in unequal density by a small population is much more significant. These conditions have not induced a coal industry as concentrated or as economically developed as retrospect suggests might have been desirable in the national interest. The nibbling at colossal resources by some 250 collieries might, to the uninitiated in the problems of coal, suggest nothing more than an aggregate of commendable enterprise. But, as this book will be compelled reluctantly to show, the irregular attack upon the stronghold of the Commonwealth's free treasures in coal has not exhibited the wisest of strategy.

It does not, of course, follow from the fact of great resources that the richest deposits are the first to be worked, though clearly the most remunerative[51] will have prior exploitation. Thus it is true in Australia, as it is in the United States, that the newer mines opening up can be worked under easier rather than harder conditions "imposed by nature."[52] This observation does not overlook the fact that knowledge of the coal resources of the country is not to be gained quickly or purchased without considerable cost. Time and means are needed for both preliminary geological surveys and for the "proving" of coal deposits. This is true of an old coal-producing

[51] The rich Greta measures were not worked until after 1891, and not extensively until after 1901. The relatively poorer seams of the Newcastle measures nearer the coast began to be developed in 1797, the year of their discovery.

[52] Hamilton and Wright: "The Case of Bituminous Coal," p. 70.

country like Great Britain, as it is more obviously true of a new country like Australia. Not the costs imposed by nature, however, but the costs imposed by man himself multiply the hazards which, paradoxically enough, make a wide range of coal resources dangerous and embarrassing. The economic problems of coal in no small measure are the difficulties of adjustment to these perils and embarrassments.

CHAPTER III.

THE ECONOMICS OF MINING TECHNIQUE.

Such, then, are the resources and such their present exploitation, which we call the Australian coal industry. From the dull, if necessary, recital of the foregoing facts we may now pass to a more enlivening analysis of the performance of the industry itself.

I. The Winning of Black Coal.

Black coal mining methods in Australia are the common features of the craft the world over. But at least three special factors have wrought an influence in producing whatever is distinguishable in the technique of the Australian industry. These factors have been the inheritance of British mining traditions, the control passively exercised by physical conditions, and the natural protection of geographical isolation.

The influence of the British tradition has been complete. The names of towns and collieries,[1] a mixed mining terminology imported from English, Welsh and Scottish mining fields, and practices evolved in the building of the art of mining in the old country, are the evidence of this inheritance. Bord-and-pillar[2] and long-wall methods, the two time-honoured British types of underground coal winning, are both practised. But physical conditions have favoured the selection of the former as the predominant method in Australia, as they have given ascendancy to the latter in Britain.[3] By far the greater part of the black coal mined in Australia is from seams over four feet thick. Indeed, no less than 60 per cent.

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[1] More especially in N.S.W. and Queensland. Collieries bearing English, Scottish or Welsh names are also to be found in Tasmania, Victoria, and Western Australia.

[2] Known also as "room-and-pillar," "pillar-and-stall," and "stoop-and-room." "Bord-and-pillar" is the Durham phrase commonly used in Australia.

[3] "Bord-and-pillar" is predominant in the United States, and "long-wall" in European countries, for similar physical reasons.

is derived from seams of a thickness of fourteen feet or over. It is to seams more than four feet thick that bord-and-pillar mining is specially, though not exclusively, adaptable. This is a process of cutting up the seam into long rooms or bords driven from "headings." On either side of the bords and headings are left the pillars or large blocks of solid coal for the support of the roof. What thickness of pillar or width of bord or "heading" will be adopted is governed by the nature of the coal, floor, roof and a variety of other considerations in the experience of the mining surveyor or engineer. It is for thin seams, on the other hand, though again not exclusively, that the long-wall method is suitable. This is a method, as the name suggests, of attacking a long face of the seam in such a way that the superincumbent strata are either supported by a packing of waste material or allowed to cave in *behind* the miners as they progress. It possesses the double virtue of being simple and of permitting easy ventilation of the workings, though obviously it demands considerable ingenuity when employed upon thick seams.[4]

It will be thus seen that physical conditions in the great majority of mines in Australia have dictated a choice of the bord-and-pillar system. Only two mines in New South Wales, one in Queensland, two in Tasmania and none at all in Western Australia, work long-wall.[5] About half the coal from the State Coal Mine and a little over half that from the thirteen privately-owned small-output collieries in Victoria[6] is drawn from long-wall workings.

The economic significance of mining methods lies in what they mean for present costs of extraction and in what they mean in terms of conservation of coal resources for the future. How do the methods prevailing on the Australian coal fields meet these tests? The adoption of the bord-and-pillar system in 224 out of the 251 collieries in the Commonwealth, as the most obviously economical response to the conditions imposed by nature, might itself be held to be sufficient answer. This fact, however, is evidence rather of Australia's good fortune in the possession of much readily-worked, thick seam coal, than of the irreproachableness of the long-established and favoured method of working. For already the prevailing method is under challenge from the most capable of the industry's mining engineers.

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[4] As done in some parts of Warwickshire where the thick inclined seam lends itself to an ingenious "retreating" long-wall method. "Historical Review of Coal Mining" (published by the Mining Association of Great Britain), p. 57.

[5] In N.S.W. the Stockton Borehole (3 ft. 6 in.) and Sydney Harbour (5 ft. 9 in., adoption of long-wall being due to great pressure at 2,900 feet depth). In Queensland the Styx, No. 3 (State) Mine. In Tasmania the Mt. Nicholas (up to 6 ft.) and the York Plains (up to 4 ft.).

[6] I.e., from all seams less than 4ft. thick.

The bord-and-pillar method as it is currently practised in Australia has as its objective the low-cost extraction of the best coal first. Competition for the existing market dictates this policy for the colliery proprietor. The removal of supporting pillars and the unworked portions of seams not cut to their full height is normally given a late, if not a secondary, place in the programme of a mine's development. It is when a mine has been worked to its boundaries that the recovery of such standing coal is made in retreating. Either trading or technical considerations, or both, may recommend this procedure. Thus in the Western District of New South Wales the trading coal companies in general leave unworked for the present anything from 1 ft. 9 in. to 12 ft. 8 in. of the inferior portion of the seam, although collieries in the ownership of and supplying coal for manufacturing and transport industries normally work the whole seam.[7] On the Maitland field of the Northern District convenience has dictated the present working of from 8 to 11 feet of the main Greta seam, which ranges from 14 to 35 feet in thickness.[8] In all Crown leases there is specified both the percentage of coal to be left in pillars underground[8a] and the maximum width of all bords, cut-throughs, headings and cross-cuts. In workings lying directly beneath the catchment area of the Sydney water supply over part of the Southern District, whose workable seams of from 3 to 11 feet thickness are in general cut to their full height, pillars may not subsequently be removed without the sanction (never yet given) of the Secretary for Mines.

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[7] Report of Royal Commission on Coal and Shale Mines in N.S.W., 1926, p. 4.

[8] The Greta seam at St. Helier's, near Muswellbrook, reaches the abnormal thickness of 51 ft. 9 in.

[8a] From 60 to 70 per cent. in seams from 500 to 1,000 feet and from 70 to 85 per cent. in seams from 1,000 to 2,000 feet below the surface. For depths not as low as 500 feet the percentage is under 60.

From the standpoint of business economics the demands both of present trading and present technical convenience are difficult to deny. But from the vantage point which permits a view at once both of the remoter future needs of the Commonwealth and of the nearer future expectations of the coal mining business itself, it becomes both possible and imperative to challenge these demands. A price that is eventually uneconomic may be paid for present convenience. If current mining methods in Australia cannot, in the first place, satisfactorily meet the charge that they are ministering unfairly, if to an extent excusably, to the wants of the present generation of coal producers at the expense of its successors and of the larger community of future consumers; if, in the second place, in the light of all that is promised in the newest mining technique elsewhere, they may be shown, less excusably, to be unnecessarily prodigal of human energy; then might we well hearken to the voices of the more critical and forward-looking of the technicians themselves.

The gravamen of the complainants' accusation against the existing bord-and-pillar practice is that it involves a "scandalous and unnecessary waste of coal," which is "a reproach to those responsible";[9] that "it is probable that 50 per cent. of the coal is lost underground";[10] that "it is a reasonable assumption that in some cases 70 per cent. will be lost."[11] The attack of the technicians is concentrated at present upon the losses already accumulating, but still preventable, in the working of the Greta or Maitland, the richest of the Australian seams, although, inferentially, their strictures have some application to the exploitation of the coal beds of other fields.[12] As an offset to the advantages of great thickness and excellent, all-round quality, the Greta seams are subject to the dangers of spontaneous heating, due in part to about two feet of "brassy tops"[13] in the upper part of the seam. "The false economy of driving too high in the coal seam during the first working and the ripping of the tops in all the old bords,"[14] together with, and partly as a corollary, the necessity for sealing off the portion of the colliery where an outbreak of heating occurs, have resulted in the complete loss of vast stores of excellent coal. On the evidence of one of the most experienced mining managers in the Northern District,[15] the Royal Commission of Enquiry in 1926 calculated that, as a result of present methods of extraction, the quantity of coal that will be recovered in the eleven most important collieries working the thick seams of the Greta series will be about 242,500,000 tons, or *three-tenths only* of the total available.

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[9] J. T. Watson: "Paper, No. 11," Vol. V., 1924, Institution of Engineers of Australia.

[10] J. Fletcher: "The Coal Measures of N.S.W. and their Economical Exploitation," "Chemical Engineering and Mining Review" (Melb.), Aug., 1928.

[11] Joshua Jeffries: Evidence before Royal Commission on Coal and Shale Mines of N.S.W., 1926.

The present failure to save for future extraction up to 70 per cent. of the richest and most easily accessible part of Australia's black coal heritage clearly warrants strong advocacy of the rights of posterity. The future, as inheritor of an estate in remainder, might fairly be expected to evolve its own economies in working relatively inferior resources, but it should not be forced to live on poorer means because those enjoying the present life estate in coal are prodigal spenders. It is as advocates of a not very remote future that forward-looking experts in Australia are urging modifications of bord-and-pillar practice already adopted economically in other countries. The most important of these suggested modifications is the system of hydraulic stowage. This is a method to ensure prevention of fires and the safe extraction of pillars by filling up the intervening spaces with sand or other waste material flushed into position with the aid of water.[16] Another suggestion is that the thick Greta seams should be worked in sections or benches, the upper section having all its coal worked in advance of any working in the lower sections.[17] Still another suggestion is that the coal in these seams should be extracted by means of small panels and barriers worked in a non-consecutive order in such a way as to permit complete removal of the coal, the minimising of risks of spontaneous heating and coal dust explosion, and adaptability to machine mining.[18]

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[12] Thus Mr. J. T. Watson (op. cit.) and Mr. W. Humble, late Chief Inspector of Coal Mines, N.S.W. (evidence before Royal Commission, 1926), draw attention to the "appalling waste of coal due to improper methods of mining" of the past in the "Delta" collieries of the Newcastle field, but show that even now "there is no engineering or mechanical impossibility involved" in getting much of the valuable coal which has been left in abandoned workings. It is generally recognised, on the other hand, that the mines operating the important Bulli seam in the Southern District "have been laid out and are worked in a manner which permits of a high percentage of extraction; and that in that respect they rank very high amongst the mines of the State." (Watson, op. cit.)

[13] Pyritous coal containing marcasite, the unstable form of pyrites. This material decomposes in the presence of air, heat being evolved in its chemical passage into (mainly) sulphate of iron. Professor Sir T. W. E. David, in his "Memoir on the Geology of the Hunter River Coal Measures, N.S.W.," 1907, p. 136, urged the complete removal of "brassy tops," during coal extraction, as the safest guarantee against fires.

[14] J. Fletcher (op. cit.).

[15] Mr. Joshua Jeffries.

Coal proprietors in the Northern District of New South Wales, where the need of coal conservation is most apparent, have shown no enthusiasm for the suggested reforms. The method of sealing off areas underground has been under expert criticism since as early as 1904, but despite the numerous fires that have plagued the collieries of the Maitland field and the consequent losses of coal reserves, the profitable returns from mining enterprise have been sufficiently high to lull any fears of nemesis which may have been inspired by the critics. The coal industry on this field has enjoyed to the full its income of economic rent. This has been assured by the all-round superior quality of its coals over those of its Australian and New Zealand competitors and by the advantage of its geographical situation over that of oversea rivals which might seek entry to the Australian market. This natural protection has been aided with just enough organisation on lines of artificial monopoly to make assurance of rent income doubly sure.

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[16] As practised in some mines in Great Britain, Germany, United States, France, Belgium, India, Straits Settlements, and elsewhere.

[17] W. Humble, Exhibit 191, Min. of evid., Royal Commission, 1926.

[18] Scheme of Jas. Fletcher, consulting mining engineer. For details see article in "Chemical, Engineering and Mining Review" (Melb.), Aug., 1928.

But costs of extraction, transport and marketing have been mounting up in the meantime to threaten these advantages. Hence proposals such as hydraulic stowing, which twenty years ago, when most of the Maitland mines were in their infant stages, could have been adopted for a cost at its worst involving postponement of dividends, now loom up as unwelcome embarrassments. The coal proprietor takes cover in the argument that the public would resent the increase in price which would be bound to follow,[19] or that it would be absurd to expect mines with thick seams to adopt hydraulic stowing when those with thin seams would not need to do so.[20] The technician's rejoinder is that, were the proprietors to "make one big interest of it,"[21] as they might for the sake of the industry now and in the future, a general system of sand flushing might be made applicable to the Maitland field, at no insuperable cost, even though it involve the construction of ten miles of railway to the nearest large supply of sand;[22] or that were a system of crushing stone adopted by individual collieries, it could be accomplished at reasonable cost.[23]

If to the waste of coal involved in underground extraction in each colliery there be added the irretrievable losses caused by the practice of leaving thick barriers of coal between mining properties and by Government and private surveying of railway and township sites without reference to the coal deposits below, it will be readily inferred that the evolution of Australian coal exploitation, more especially in New South Wales, has been at a needless expense of the future. In many instances barriers 132 feet wide are left in each side of boundary lines. Were hydraulic flushing in vogue, sand could be made to replace between 600,000 and 700,000 tons from a seam 12 feet thick in every mile of boundary.[24] On top of this, such towns and villages in New South Wales as Cessnock, Stanford-Merthyr, Aberdare, Kearsley, Abermain, Pelaw-Main, Hebburn, etc., are so situated as to imprison many hundreds of thousands of tons of potentially valuable coal.

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[19] Royal Commission, 1926, Evidence, Q., 27,774.
[20] Ibid, Q., 27,788.
[21] Ibid, Q., 27,788.
[22] Between Stockton and Port Stephens, Ibid, Exhibit 185.
[23] It should be stated that there is considerable difference of opinion among the technical experts as to the practicability of introducing hydraulic stowage.

The foregoing indictment of wasteful procedure in the Australian coal industry may be easily but wrongly construed as a general condemnation of the ways of those who produce our coal. In the first place, an indictment is not a condemnation. In the second place, to be a spendthrift is not necessarily to be wholly without virtue. In the third place, even a spendthrift may have his excuses. Not a few in directive positions in the industry admit the justice of the general indictment, but most will assert that, within the powers of their present achievement, not a ton of coal is wantonly wasted. For waste, at any time, is a relative term conditioned by the possibilities of a situation. In few collieries does the mine manager, with the given physical conditions and labour force at his disposal, cease to do daily battle with the problem of waste. Yet, in so far as waste is to be regarded as relative to the economies of all known and proved methods of extraction, it cannot be doubted that the mine manager in Australia is handicapped by the influences which have shaped his mining practice. It may be the destined end of the newer influences now beating upon the industry to force the adaptation of methods in existing mines to a new waste-saving procedure, and to require an entirely new lay-out and method for mines yet to be opened.[25]

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[24] One witness before the Royal Commission, 1926, estimated barrier coal left untouched from about Stanford-Merthyr to about Bellbird, on the Maitland field, a distance of about 12 miles, to be roughly 20,000,000 tons.

[25] "If the methods of mining now in operation were the only ones applicable under the conditions existing in the Maitland district, no exception could be taken to them, and the consequent heavy loss of coal would have to be accepted as inevitable. However, that such is not the case is perfectly well-known to every manager who has kept in touch with modern developments in other countries."—Watson: "Waste of Coal," p. 201.

In differing degrees the older influences have affected the equipping and underground organisation of the collieries. As in other countries, there are to be found badly, indifferently and well-equipped mines. Usually the larger private collieries and State undertakings, as might be expected, are the exemplars in equipment, although some relatively small private mines do not compare unfavourably with the larger. Coal mining equipment covers a diversity of stationary and mechanical aids between the coal face and the railway truck. There may or may not be electrically or compressed-air driven machines for cutting the coal. There is bound to be some form of underground and surface haulage, either with or without the aid of ponies, horses, cables, and steam, electric or internal-combustion power. Even shaker and belt coal conveyors will not entirely displace skips, rails and timbering. Winding machinery is essential in all deep mines, whether the exits be shafts or tunnels;[27] and all collieries of sizable output will use tipple and screening apparatus. The means of underground ventilation and drainage are alike indispensable. A boiler-house, an engine-room, a power-house (in a mine electrically served with light and power), repair shops, yard works and an administrative office, together with an all-essential adequacy of railway trucks, complete a colliery's minimum equipment requirements above ground.

The organisation, equipping and day-to-day conduct of a coal mine are not comparable with those of a factory. Organisation in a mine is essentially an engineering problem, but distinguished from most of the tasks of engineering specification by many unpredictable difficulties of operation and cost. Unexpected "faults" in strata, altered gradients, changes in the quality of the seam, the seepage of water, the exhalation of gas, spontaneous combustion of coal—all these and many more uncertainties make mining operations a routine of contingencies.

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[27] Most Australian collieries are worked by tunnels. In N.S.W. 62½ per cent. of the coal is drawn from tunnels, 37½ per cent. from shafts.—"Mines Department Annual Report for 1927," p. 53.

Every coal "place"[28] has its own local problems for miner, deputy and manager. An adequate supply of skips must be kept moving to each place, the haulage system must avoid derailments, breakdowns and congestion, and a sufficiency of railway trucks must be got to carry off the coal from the tipple.[29] With working places scattered fanwise, maybe over an area of several square miles, the task of supervision and correlation makes many demands upon managerial resourcefulness.

All these problems are the daily round of the mine manager in Australia, as elsewhere. The evolution of mechanical aids to mining operation has in the nature of things been a slower and more chequered process than in manufacturing. To those unfamiliar with the industry the symbol of mechanisation in mining is the modern coal cutting machine. But mechanisation means much more. The history of mining is not only a record of ingenuity applied to the stubborn face of the coal through successive stages from "Willie Brown's iron man"[30] and the earlier circular saw, both worked by human muscular power, the horse-driven pick machine, and the early applications of compressed air, steam and water, to the most modern air or electrically driven disc, chain and bar machines. It is equally a story of hard-won increments of invention and improvement in mine ventilation, lighting and drainage, bore-drilling and shaft-sinking, underground haulage and winding, the prevention of explosions, coal washing and screening, and even in the instruments which have perfected mine surveying. None the less, it is by the advance of machine method in the actual winning of the coal from the seam, and by the increase in the use of motor-power in the conveying of coal to the surface, that the degree of mechanisation achieved in the coal mining of any country may be readily measured.

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[28] The coal face in the bord where each pair of miners work.

[29] The device for tipping the contents of the skip on to the screen. The braking mechanism and control gear of the semi-automatic tipplers in use at Wonthaggi, Victoria, are the invention of the General Manager of the State Coal Mines, Mr. G. H. Broome.

[30] A mechanical pick, operated by levers, gear wheels and a crank handle, invented in 1761.

Judged by this measure, Australian black coal mining is relatively backward in mechanisation. The New South Wales Mines Department alone publishes a summary of the number, class and motive power of coal cutting machines employed. In 1927 only 20 per cent. of the coal output of that State was machine cut.[31] As a considerably smaller percentage of the output of other States was machined, the percentage for the Commonwealth would be somewhat under 20, which is about the percentage similarly mined in Great Britain,[32] in striking contrast to the 71 per cent. in the bituminous industry of the United States[33] or to the 50 per cent. in the mines of the Ruhr.[34] Mechanisation in Australian black coal mining, in still more marked contrast with these countries, is falling back rather than advancing in terms of the percentage of coal cut with the aid of machines. In Great Britain between 1913 and 1924 the tonnage percentage of machine cut coal increased from 8.48 to 18.69, the number of machines from 2,897 to 6,830, or by 135 per cent., and the number of mechanical conveyors from 377 to 1,373, or by 264 per cent.[35] This represents a faster *rate of growth* than that of the United States over the same period, where the machine cut percentage grew from 50.7 to 69.5 and the number of machines from 16,379 to 18,660, or by 14 per cent.[36] If mechanisation in these two countries has been at least progressive, in Germany since 1913 it has been amazing. From the mines of the Ruhr, where irregular geological formation is a greater handicap against machine extraction than in England, and still more so than in the United States or Australia, only five per cent. of the coal was got by mechanical means in 1913, but by 1925 more than half was being machine won, the number of coal cutters increasing from 257 to 1,798, hammer drills from

[31] "Annual Report, Department of Mines, 1927," p. 54.

[32] "Royal Commission on the Coal Industry (U.K.), 1925," Vol. III., p. 184.

[33] "Coal in 1926, U.S. Bureau of Mines."

[34] "International Economic Conference, 1927, Memorandum on Coal," Vol. II., p. 30.

[35] "Royal Commission on the Coal Industry, 1925," Minutes of Evidence, 31st day, p. 29.

[36] "Coal in 1925, U.S. Bureau of Mines," p. 451.

10,141 to 31,516, pneumatic percussion picks from 189 to 35,666, and "shaker" conveyors from 1,672 to 6,195. A similar astounding growth of mechanisation, following German "rationalisation," has come about in both Upper and Lower Silesia.[37] In the New South Wales mines of Australia, on the other hand, the percentage of machine cut coal has fallen progressively from 30.3 in 1911 to 20.4 in 1927, even though the number of machines has increased from 233 to 318, or by 36½ per cent.[38]

Economic pressure of one sort or another has led to the increase of mechanisation in Germany, the United States and Great Britain. In Germany since 1918 it has been the necessity for making up, on a smaller territory, her losses of 26 per cent. on pre-war production. In the United States it has been the abnormal competition from over capacity which has forced the coal owner to find means of lowering costs.[39] In Great Britain, and more particularly Scotland, it has been the necessity for exploiting thin, hard seams "which would otherwise not repay working."[40] But until within the last year or two there has been no comparably pressing urge upon Australian coal proprietors. Forces in Australia have, indeed, tended to a different result. The attitudes of the two main bodies of opinion in the industry have produced altogether too unfavourable an atmosphere for a vigorous growth of machine mining. The miners in New South Wales are strongly organised in hostility to the machines, more particularly to those electrically driven, if proposed to be used in "safety lamp mines." The objection is taken ostensibly on grounds of safety.[41] But the real grounds are the fear of mechanisation as a displacer of labour. Moreover, the existing wage structure in the industry permits miners to earn much higher wages by "grunching" or "shooting off the solid"[42] than they can by filling the skips after machines have cut the coal. Enterprising proprietors, on the other hand, have wished to extend the use of the machines. But the opposition of the miners and, until recently, the enjoyment of the returns in the gift of an adequate monopoly have together discouraged a growing use of machines even in those collieries well able to afford their installation.

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[37] "International Economic Conference, 1927, Memorandum on Coal," Vol. 11., pp. 29-31. From the viewpoint of British mining engineers, air picks and hammer drills are not in the category of coal machines.

[38] Mines Departments Reports.

[39] Lubin and Everett: "The British Coal Dilemma," p. 152.

[40] "Report of Royal Commission on the Coal Industry," 1925, Vol. I., p. 122, and Lubin and Everett, op. cit.

[41] The miners in N.S.W. have so far been successful, by threats of strikes, in preventing the introduction of electric coal cutters in safety lamp mines. Hence, while the number of percussive (compressed-air driven) machines has increased between 1917 and 1927 from 94 to 203, the number of electrically driven chain-breast machines has fallen from 179 to 115. In one mine, at least, the management, in order to keep machines already installed at work, countered the miners' edict by withdrawing safety lamps and substituting naked nights.

The same influences have operated to prevent any appearance at all in Australian mines of the mechanical face conveyors in use in Great Britain, Germany, the United States and elsewhere, even though there is wide scope for them in thick as well as thin seams; or of the newest of the ingenious devices, mainly American, for mechanical loading at the coal face, the introduction of some of which "is virtually to supplant the picks and shovels of from 15 to 20 miners."[43] By so much the more these strange machines may be counted upon to displace labour or regiment it, or be rumoured to do so, by so much will the Erewhonian resistance of the Australian miners be intensified. The proprietors, who have to operate in an almost completely unionised industry, are well aware of this, and for the present are prepared to hasten slowly. Moreover, they have heard dark rumours from America that the newer mechanisation threatens as much confusion in the economic problem of the market as it promises greater productive performance in the mine itself.[44]

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[42] The method of loosening the solid coal face by blasting. In the Newcastle and Maitland collieries, in which pick mining operates, practically the whole of the coal is shot out of the solid. In several of the mines the coal is all got by machines, either of the electrically driven Sullivan, Jeffreys or Goodman types, or of the compressed air Ingersoll type; at others the process is a mixed one. The old skilled method of getting coal by picks is fast disappearing.

[43] Carter Goodrich: "The Miner's Freedom." These machines—the Jeffrey and Goodman scraper loaders, the Myers-Whately, Coloder and Joy double conveyers, the Jeffrey combined cutting and loading machine—are as varied as they are ingenious.

[44] "The glut in coal has been increased by the great advances in the use of mechanical devices. The excess production has caused the operators to increase the productive capacity of their plants so as to reduce costs, and this has had a further effect in increasing the glut of coal and in deepening the sag in the price curve." R. D. Hall, in "Coal Age," 4th June, 1925, quoted by Hamilton and Wright: "The Case of Bituminous Coal," p. 101.

Within the traditions that have conditioned their growth the most efficient of the Australian mines have not been sluggish in the adoption of technical improvements. The pitch of seams in nearly all collieries has dictated steam or electrical rope traction for the main haulage and along main roads.[45] Only in New South Wales (in four collieries, two of which are safety lamp mines) have storage battery locomotives been introduced, and their use is likely to extend for main roads. Because of explosion risk involved the overhead electric trolley has not yet been introduced into Australia, not even in non-gaseous mines.[46] Horse haulage is the rule from working places to sidings. Hand wheeling of skips to maximum distances varying from one chain in Tasmania to fourteen chains in New South Wales (there is no hand wheeling at all in Western Australia) is confined almost solely to inclined seams. In this respect Australian is probably more economical than British practice. Skip sizes vary considerably in the several States and from colliery to colliery, ranging from as low as 7 cwt. in Queensland to 35 cwt. in New South Wales (the commonest being 20 cwt.), but there are few or none of the "pygmy tubs" of 300 or 500 lbs. capacity, known to many mines in Britain, as, so far, there has been no adoption of the two, three or four ton "wagons" now being advocated in that and other countries.[47] In short, in its haulage as in other technical practices, the black coal industry of Australia exhibits the presence of British rather than other influences, with just such modifications as are wrought by the local environment and its isolation from the greater centres of mining activity.[48]

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45. On either the endless rope, main rope, or main and tail rope systems.

46. The only trolley wire system in Australasia is in a New Zealand mine.

47. Lubin and Everett, op. cit., p. 155. Three-ton skips are being installed in the Elrington Colliery, Maitland district, N.S.W.

48. The question of railway haulage from the mine is dealt with elsewhere in this book. Suffice here to say that the practice of British railway companies compelling coal owners to supply their own coal wagons has been followed by the Government railways of N.S.W., though not by the railways of other States. About 500,000 coal wagons on the British railways (about three-quarters of those in use) are privately owned by some 10,000 separate owners, who are "either mine owners, factors, merchants, exporters or wagon-owning companies" (Lubin and Everett, op. cit., p. 280). In Australia over two-thirds of the coal wagons proper are privately owned, mainly by colliery proprietors. Practically all of

II. THE MEASURE OF PERFORMANCE.

The economics of mining technique raises not only the question of conservation of national resources. It is equally concerned with the conservation of time and energy, or with the net utility remaining to those engaged in the craft and to the country as a whole after the expenditure of all the time-effort up to the point of despatch of the coal from the mines has been taken into account. The appraisal of this utility raises great difficulties of measurement. It is obviously not merely a quantitative question of the amount of coal raised in a given period per person employed, nor yet of the pit-head price per ton received. Its full social meaning is not to be gauged even by the contribution made by the coal industry to the real national income per head, shown by however useful an index of prosperity based upon available data;[49] for there is no adequate measure of the imponderables of worry, vexation, and "unnecessary" thought expended in the adjustments and readjustments made in the industry before a net balance of utility is provided. Yet, of course, it is part of the task of an economic study to essay quantitative measurement. It will be left to later chapters to widen the meaning of this measurement, but it will be convenient here to fix a starting point. That may be done by briefly examining the relation of coal output to the labour involved.

The data in the two accompanying tables of comparative output per mine worker, if used with the necessary caution, provide a basis for the measurement of this relationship. A word of warning as to their limitations, however, must be given. In the first place, both tables give the changes in the annual output per mine worker

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these are in N.S.W. (16,778), most of them (14,817) in the ownership of Northern District collieries. Some 75 are privately owned in Tasmania. In all States a large number of other Departmental wagons are pressed into the service of coal carrying when necessary. While the average capacity of the N.S.W., Victorian and South Australian Departmental coal trucks is from 10 to 20 tons, the average capacity of those of the other States' railways and of the private owners in N.S.W. runs mostly from 6 to 10 tons. Most of the coal wagons on British lines are from 8 to 12 tons' capacity, those on German, French and Belgium 20 tons, those on American over 40 tons. The influence of the British tradition on Australian practice is here again strongly in evidence.

[49] See, e.g., the index used by Dr. F. C. Benham: "The Prosperity of Australia," Ch. II.

TABLE III.

BITUMINOUS COAL INDUSTRY.

COMPARATIVE OUTPUT PER YEAR PER MINE-WORKER (BELOW AND ABOVE GROUND).

(Tons of 2240 lbs.)

Year.	British Empire.							Other Countries.				
	Australia.											
	N.S.W.	Common-Wealth.	New Zealand.	Canada.	South Africa.	United Kingdom.	India.	United States.	Germany.	France.	Belgium.	Japan.
	(*a*)	(*b*)	(*c*)	(*d*)	(*e*)	(*f*)	(*f*)	(*g*)	(*f*)	(*f*)	(*f*)	(*f*)
1920	538	507	452	416	354	187	94	786	179	118	137	83
1921	509	478	437	412	305	144	94	560	164	128	129	95
1922	472	451	407	411	304	217	95	543	168	135	136	108
1923	456	425	394	432	376	229	98	715	102	139	140	101
1924	505	472	427	378	376	220	104	699	207	150	132	117
1925	474	448	442	393	393	221	111	791	232	146	141	121
1926	439	436	434	365	390	(*i*)	113	862	(*i*)	152	154	(*i*)
1927	454	446	(*i*)	499	390	233 (*h*)	(*i*)	(*i*)	(*i*)	(*i*)	(*i*)	(*i*)
Average ..	481	458	427	413	361	207	101	722	175	138	138	104

(*a*) N.S.W. Mines Department's *Reports*.
(*b*) Based on Commonwealth *Year Books*.
(*c*) Based on N.Z. Mines Department's *Reports*.
(*d*) Adapted from *Coal Statistics for Canada*, by excluding workers and quantities in other than bituminous coal.
(*e*) Govt. Mining Engineer, U. South Africa. Based on numbers recorded as "in service." If numbers recorded as "at work" (about 15% fewer) are used, the output figures are considerably increased.
(*f*) Adapted from *Report of Indian Geological Survey*.
(*g*) *Coal in 1926*, U.S. Bureau of Mines.
(*h*) Adapted from *I.L.O. Report, Series D., No. 18*.
(*i*) Not available.

TABLE IV.

COMPARATIVE OUTPUT PER YEAR PER MINE-WORKER IN AUSTRALIA, BY STATES, 1927.

State.		Total Employees Below and Above Ground.	Total Tonnage Output.	Output per Employee.
NEW SOUTH WALES	Northern ..	16,809	7,145,116	425
	Southern ..	4,959	2,155,461	435
	Western ..	2,726	1,825,537	670
	State	24,494	11,126,114	454
QUEENSLAND		2,842	1,099,040	386
VICTORIA		1,880	684,245	364
WESTERN AUSTRALIA ..		748	501,505	670
TASMANIA		312	111,988	358
COMMONWEALTH		30,276	13,522,892	446

(above and below ground), not per miner working at the coal face. In the second place, the output per year, not the tonnage extracted per working shift or per hour (either of which would be preferable for certain purposes), is given. Thirdly, the lack of uniformity in the description of mine worker in the various countries, upon whose official coal mining statistics Table III. has been compiled, makes questionable a strictly reliable comparison.[50] These limitations notwithstanding, however, the tables provide an adequate basis for our discussion and raise important questions for solution.

Two facts emerge from a perusal of Table III. The first is the high place, in terms of yearly output per mine worker, occupied by Australia, and more particularly by New South Wales, among the coal-producing nations, the position of the Commonwealth being second only to that of the United States. Table IV. shows that within Australia itself there is a marked disparity in the achieve-

[50] E.g., the figures for "output per person employed" supplied by the Government Mining Engineer for the Union of South Africa, are based on the numbers recorded as "in service," which are apparently 15 per cent. more than those recorded as "at work." The official "Coal Statistics for Canada" include in the total of "employees in coal mining" those engaged in the sub-bituminous and lignite mines of the country, and for the purposes of this compilation have had to be modified accordingly. In India and Japan a very large proportion of mine workers are women. For the difficulties confronting the compiler of satisfactory international comparisons in the coal mining industry, see the excellent Report (Series D., No. 18) of the I.L.O. on "Wages and Hours of Work in the Coal Mining Industry," Geneva, 1928.

ments of the fields of the various States, those of the Western District of New South Wales and of Western Australia (which together, it is true, are responsible for only 18 per cent. of the national production) being much above the average for the Commonwealth. The second fact emerging from Table III. is that whilst the output of some countries (notably Germany, the United Kingdom, France, Belgium, South Africa, Japan, India and, to a lesser extent, the United States) has shown a tendency since the war to increase that of Australia and New Zealand has shown an irregular movement towards diminution.[51]

These facts require explanation. It can be assumed that they are a net result, like any other economic trend or situation, of a variety of contributing causes. Briefly, these causes may be affirmed to lie in the differing degrees to which coal production in the several countries and working coal fields has been affected by geological conditions, the age of colliery workings, the lay-out, organisation, methods and extent of mechanisation of mines, the racial, physical and other qualities of the mine workers, the proportion of "service" workers to those engaged upon the coal face, the length of the working day or shift and the extent of absenteeism, the constancy of the demand for coal, and the place of deliberate restriction and industrial disputes in ministering to a shortened output. To what extent have the items in this catalogue of conditioning factors determined the Australian level of output? In what measure, more particularly, have the factors of technique played their part?

In the comparative advantage of favourable geological conditions Australia is more nearly like the United States than any other country. This factor is of over-riding importance in determining the high output level. As we have seen, the Australian seams worked are for the most part comparatively thick,[52] especially those in New

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[51] The irregularity of the Canadian output makes the general trend obscure.

[52] Over 60 per cent. of the coal from seams more than 14 feet thick. The average height of bituminous seams in the United States is 5 ft. 4 in., and over 40 per cent. of the national output is from seams of over 6 feet. Only 27 per cent. of the British output is from seams 5 ft. 4 in., and only 10 per cent. from those over 6 feet.

South Wales, they are not greatly faulted, do not dip very steeply, and can in the main be attacked by means of tunnels rather than shafts. In the mines, roof conditions are on the whole good, a fact permitting a net gain in time and energy otherwise lost, despite the fact that the cutting of thick seams to the ample height usual in the collieries involves heavy timbering. Furthermore, the coal is clean, and time-costs are therefore not swollen greatly by the removal of dirt. These are conditions almost identical with those enjoyed in the United States, in marked contrast to those of Great Britain and the European continental countries. All European coal-producing countries, excepting Upper Silesia,[53] are even more handicapped than the United Kingdom, because of steeply inclined and faulted seams, which make machine mining difficult. This is the major fact accounting for the notably lower average output per mine worker on the Continent than in the United Kingdom over the period 1920 to 1927, an output, however, which improved organisation and greater mechanisation, despite natural difficulties, are increasing.[54] In the United States, Australia's compeer in geological advantage, the coal output per worker is likewise tending to improve. If, then, Australia is failing to make progress in comparison with countries both of equal and less advantage in physical conditions, it must be because of factors hindering the fullest use of her natural endowment.

Is it because of the age of the collieries? Obviously this question is more appropriate to an old country like Great Britain, where more than half the mine workers are employed in collieries over fifty years in operation, and where upwards of 78,000 men work in mines over 100 years old.[55] In Australia, even though there are possibly a few collieries still operating on properties first worked over 80 years ago,[56] the great majority are well under fifty years of age. Indeed, practically all the collieries of large output on the Maitland field (which produces nearly 70 per cent. of the New South Wales output) have been opened since 1900.[57] The time, labour, and cost problems of pumping and ventilation in very deep workings and in long haulages from the coal face to the shaft bottom, which are common enough in the obsolescent mines of older countries, are not to be entered as a cause of the noticeable decline in Australia of output per worker employed. In organisation, both of the industry as a whole and of individual collieries, in mine layout and methods, and in the slow progress of mechanisation are more probably to be found some of the responsible causes. If the organisation of the industry is found to be such that inefficient mines in competition with the efficient are growing at a rate too fast to permit the market to carry off the coal which they are all producing with more or less intermittency, then it is clear that the figure of annual output per worker must tend to shrink. How far this is true will be left to following chapters to discuss. As to internal organisation, working methods and mechanisation in mines, sufficient evidence has already been given to show that Australian coal mining procedure, with certain exceptions, lags behind the best practices of other countries. With the decline in the percentage of machine-cut coal has gone, broadly speaking, the concomitant decline in the average output of workers employed. Since, however, under 20 per cent. of all the coal produced is cut by machines, the former cannot in any major way be causally connected with the latter. Yet, because mechanisation is not merely a matter of coal-cutting machinery but embraces the application of a wide diversity of time and labour-saving appliances, and because the march of mechanisation has been hindered by a conservative attitude to changes in mining technique generally in Australia, it may reasonably be held that the Australian output figure per worker employed has been depressed far below its *possible* limits.

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[53] The natural conditions in Upper Silesia are such that, according to the evidence of the Institution of Mining Engineers before the British Royal Commission of 1925, given equal efficiency of labour, hours of work, rates of pay, competence of administration, etc., the average cost of production in wagon at the pit-head would be lower than in Great Britain.

[54] The daily output of German Upper Silesia, with its natural advantages, has risen from 36,800 tons in 1913 to 60,000 tons by the end of 1925. ("International Economic Conference: Menmorandum on Coal," Vol. II, p. 32.)

[55] Report Royal Commission, 1925, Vol. III., p. 175.

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[56] E.g., the Glebe Hill and other collieries in the Newcastle area.

[57] Mauldon: "A Study in Social Economics: The Hunter River Valley" (1927), pp. 58-60.

It will be sufficiently apparent from Table III. that the racial quality[58] of mine workers has an important bearing on the relative output of the several countries, although the significance of this factor may easily be exaggerated. Thus the lowest outputs among those enumerated are from Indian and Japanese mine workers, of whom, in both cases, not far short of one-third are females.[59] The effectiveness of Indian,[60] Japanese,[61] Chinese[62] and other Asiatic labour is notoriously at a low level for a variety of reasons based on differences between Eastern and Western standards. If, for instance, "in good Chinese coal mining it requires eight men to do the work of one American miner while in ordinary mines it takes half again as many,"[63] and this can be taken as fairly representative of the capacity of non-European labour, those countries whose mine-working population is wholly or substantially[64] white, are bound to show an ascendancy in output per worker. Yet the South African coal industry, in which there is only one white man for every 21 persons "in service" and for every 38 persons at work underground,[65] is able to show an improving rate of output *higher* than that of any European country and not very far short of those of Canada, New Zealand and Australia. It is not impossible, indeed, to imagine the decline of the Australian figure (despite the homogeneity of British stock in the mining population) and the improvement in the South African figure reaching a point of equivalence. This possibility, however, is not a very likely one and, if ever realised, will not be attributable to any deterioration in the quality of the Australian miner, who, whatever his vices of irresponsibility and however contentious his habits, is seldom impeached by his employer on the score of being a poor workman. The Australian coal industry, it may safely be claimed, enjoys no mean comparative advantage in the racial composition and quality of its labour.

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[58] Or perhaps, better, the labour effectiveness as influenced by living standards.

[59] In British India (1926) 50,470 out of 170,952 workers, or 28 per cent. ("Coal Statistics, Indian Geological Survey"), in Japan (1924) 68,452 out of 251,069 workers, or 27 per cent. ("I.L.O. Report, Series D., No. 18.")

[60] "The labourer in the Indian coal fields is primarily an agriculturalist and, considered as a coal miner, is merely a casual and unskilled worker, and . . . his standard of comfort is so low that the only effect of an increase in wages is a decrease in output, as he can obtain the amount which he needs by working fewer days in the week." ("Report of the Indian Coal Committee," 1925, p. 35.)

[61] "In efficiency the daily extraction per worker at the Yubari mine (one of the largest Japanese mines) is put at 0.64 tons, against 0.8 in England for 1918, and 2.27 anthracite, and 3.77 bituminous mines in America." ("Japan Year Book," 1926.)

[62] "The productivity of our underground labour is subject to considerable fluctuation in accordance with local conditions. Normally the output is about .55 to .75 of a ton per shift underground labourer, or about .75 to 1.10 per shift per actual man working at the face. The supply of labour falls off considerably at harvest time, and the mines shut down altogether during certain well recognised Chinese festivals, the principal being the Chinese New Year and the Dragon Boat Festival. During the first of these festivals the mines are closed for anything up to three weeks, and the output is small for a week or two on either side of the stoppage." (Communication to the author from the General Manager, Kailan Mining Administration, North China.)

[63] H. Foster Bain: "Ores and Industry in the Far East," p. 181.

[64] E.g., the United States, where 8 per cent. of the mine workers are coloured, 32 per cent. are foreign born, and 60 per cent. native born. ("What the Coal Commission Found," p. 136, by the Staff of the United States Coal Commission, 1923.)

The proportion of the total workers employed who are engaged in actually wresting "coals" from the stubborn coal face itself will have an important bearing on the output rate per mine worker of a colliery, a coal field or a coal-producing country at large. Where the number of workers rendering other than coal-cutting services is disproportionately large the output figure per person employed is correspondingly reduced. The bald distinction usually made between "underground" and "surface" workers in the published coal statistics of the various countries is of little value in enabling an estimate to be made of the factor here discussed. "Service" workers not employed at the face are in all countries except the United States and Tasmania a majority of the total numbers employed, and are in all cases more numerous underground than on the surface, as is shown in Table V.[66]

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[65] Communication from Government Mining Engineer, Johannesburg.

[66] Adapted, with the addition of figures for the United States drawn from the statistics of the U.S. Bureau of Mines for 1924, and the estimates for Australia as mentioned in the note to the Table, from I.L.O. Report, Series D, No. 18, on "Wages and Hours of Work in the Coal Mining Industry" (1928), p. 102. It is pointed out in this Report that the "hewer," or man at the face, does not represent the same category of workers in the different statistics upon which the Table was compiled; but presumably the term "hewer" (used in the Report) is intended to describe all workers concentrated upon the coal face.

TABLE V.

IMPORTANCE OF DIFFERENT CATEGORIES OF MINE-WORKERS.

(1925, except where otherwise stated.)

In Percentages of All Mine-Workers.

Country and State or District.	Underground Workers.			Surface Workers.	Underground and Surface Workers.
	At Face.	Others.	All.		
United States (1924)	58	25	83	17	100
Australia (*a*) (1927) :					
New South Wales :					
Maitland District	35	39	74	26	100
Newcastle ,,	46	27	73	27	100
Western ,,	45	32	77	23	100
Southern ,,	39	35	74	26	100
Queensland	50	34	84	16	100
Victoria	46	30	76	24	100
Western Australia	46	30	76	24	100
Tasmania	56	15	71	29	100
Commonwealth	41	34	75	25	100
Germany : Ruhr	46	35	81	19	100
Great Britain	39	42	81	19	100
Czechoslovakia	33	43	76	24	100
Germany : Upper Silesia	17	57	74	26	100
Saxony	32	42	74	26	100
France	22	50	72	28	100
Netherlands (*b*)	28	44	72	28	100
Saar	34	38	72	28	100
Belgium (*b*)	13	55	68	32	100
Poland	17	49	66	34	100

(*a*) The percentages for the several Australian States are based on authoritative estimates made for the author in mining circles. Those for the Southern District of N.S.W. are based on the conditions in eight representative collieries.

(*b*) The average number of employees at work being unknown, these percentages are based on the number of "full-time" workers, *i.e.*, the number presumed to have been at work if each had been regularly and constantly employed for the maximum number of working days.

In Tasmania the smallness of the mines accounts for the high percentage of men employed at the face, many of them combining "service" duties with those of hewing. The relatively low percentage of workers at the face in the Maitland and Southern Districts of New South Wales is probably to be accounted for by reasons bound up in both physical and labour conditions. On the Maitland field, as we have already observed, abnormal thickness of the seam necessitates an unusually large number of shiftmen or "datalers" engaged on timbering work, and, generally speaking, the number of men employed on the surface cleaning coal is comparatively large. In the Southern District, the number of "service" workers on timber repairing is similarly swollen because of friable roof conditions. But at least equally important as a cause on the Maitland field is the pressure which the miners have over years been able to bring upon the managements. This pressure has been in the direction of releasing the hewer from the many incidental jobs which serve to divert him from actual coal getting. Thus the number of men timbering at faces, wheeling and handling coal per hewer, has tended to increase, with the probable effect of contracting the annual output per mine-worker. Distinctly contrary to the practice in other coal-producing countries, for instance, a wheeler in the Maitland district ordinarily does not wheel coal from more than two places (four miners) and in some cases from only one place (two miners). This combination of factors in the predominant Australian coal field, it will be seen, serves to place the proportion of hewers in the Commonwealth somewhat lower than the percentages in the United States and in the Ruhr district of Germany. Whether or not this tendency to increased "service" workers in Australia is yet of major economic significance it is difficult to say, but undoubtedly it plays some part in the observed trend to decreasing annual output per mine-worker.

It is obvious, also, that the length of time spent per shift or working day by the mine-workers, especially those actually concentrated on the coal face, will be an important factor in determining the average annual man-output. Consideration of this question leads to a necessary distinction between nominal and real working time, between statutory or award requirements (where such exist) and actual time performance, between the total time in the mine and the net time actually employed in getting coal. Nominal hours will, for instance, be reduced by underground workers going and coming from pithead to coal face, by necessary preparations before the work starts, and by breaks such as those due to blasting or hold-ups of skips, tools and material. Some of this actual time loss (such as travelling and meal time) may be measured; some of it (such as that incurred through blasting operations and delays in getting equipment) cannot.

The International Labour Office, in one of its most useful world surveys,[67] has attempted a comparison of actual hours worked by underground mine-workers in the most important coal-producing countries. Unfortunately, because of the inadequacy of the statistical machinery or because of governmental lethargy, data from several important countries were not available. The facts concerning the Australian industry are among those missing. In the following Table, however, an attempt is made to place Australia in relation to the countries mentioned. It must be kept in mind that the estimate, although an authoritative one, has direct reference to New South Wales only.

TABLE VI.

HOURS OF WORK FOR UNDERGROUND WORKERS.

	Length of Ordinary Shift, Statutory or Award.	Statutory or Award Week or Fortnight		Travelling Time, including Winding.	Length of Breaks and/or Meal (Crib) Time.	Length of Time at Face.
		W.	F.			
Germany: Ruhr ..	7 to 8	—		—	—	—
Upper Silesia ..	8	—		—	—	—
Lower Silesia ..	7 to 8	—		—	—	—
Saxony	8	—		1.25′	20′	6.15′
Belgium	8	48 (a)		45′ to 1.10′	40′ to 60′	6.20′
France	8	—		1.14′	29′	6.17′
Great Britain ..	8	—		2.15′ (d)	—	6.45′
Netherlands ..	8.30′ (a) 8 (b)	46 (b)		1.10′	30′	6.20′
Japan	11	—		1.36′	1.00′ (e)	8.21′
Australia (N.S.W.)	8		(c) 86	1.30′	.30′ (f)	6.00′

(a) Statutory. (b) Agreement. (c) Award. (d) Including "breaks" in work underground. (e) Rest time only. (f) "Crib" or meal time.

It will be seen from this Table that the Australian miner is engaged in actual coal winning a somewhat shorter time each shift than the miner of any of the countries compared. A similar relationship is seen when mining in India, South Africa and the United States is brought into the comparison. The gross time, bank to bank,[68] is fixed by industrial award in Australia at 86 hours per fortnight, made up of 10 shifts of eight hours each and a short shift of six hours on the "back"[69] Saturday. This protective maximum, apart from the fact of the deduction of two hours from actual working time on account of travelling and "crib" time, indicates the advantage which the Australian miner has over the native workers in India, where the statutory working week is 54 hours,[70] and in South Africa, where there are no statutes, awards or agreements governing hours, and where the average is about nine hours a shift. In comparison with the United States, the Australian actual working time is probably round about an hour less per shift. In 15 States of the Union, it is true, statutes fix the maximum hours per shift at eight, although, generally speaking, working hours are fixed by collective agreement. The average time in the American bituminous mines, however, is somewhat over eight hours per working day (as estimated in 1926 for 556 mines in various States employing together about one-quarter of the workers in the bituminous industry of the country), and the actual time at the face, excluding time travelling and for meals, 7 hours 54 minutes.[71]

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[67] "Wages and Hours of Work in the Coal Mining Industry," 1928, Series D, No. 18.

In an estimate of the factors affecting man-output the Australian shorter actual working shift is obviously of significance. This is all the more so when it is remembered that for the past eight years the average number of working days in New South Wales has been about 20 per cent. below its possible maximum.[72]

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[68] I.e., from the time the employee enters the mine at the pit-head until he leaves it.

[69] Alternating with "pay" Saturday, when no work is done.

[70] The Government of India claims that this statutory maximum is, however, greatly in excess of the average of probably 8 hours worked per day.

[71] I.L.O. Report, p. 239.

[72] Even so, this is a better performance record than that of the United States bituminous industry, in which annual working days in the same period (1920-1927 inc.) have been about 38 per cent. below the possible maximum. (Publications of U.S. Bureau of Mines.)

The circumstances of geological structure, age of colliery workings, the internal organisation, lay-out, methods and mechanisation in the mines, the quality of the workers, the proportions of the different categories of mine work itself, and the working time of the employees, are among the factors affecting the relation of the coal output to the labour involved most directly connected with the question of technique. Their discussion is perhaps alone appropriate to this chapter. A satisfactory inductive analysis of the labour-output relationship, however, demands enquiry into the significance of trading conditions, of acts consciously restricting output, of the dissidence which afflicts the industry, and of other non-technical elements in the complex situation of coal. This section, for the sake of completeness, will therefore conclude with brief reference to this significance, but its fuller examination will be left to later chapters.

What, then, of trading conditions? It is obvious, first of all, that "slackness of trade," wherever it exists and whatever its causes, is a frustration of good intentions and technical efficiency. However rich or easy to win the coal seam, however advanced the methods of extraction, however great the capacity of the workers and their willingness to work, unless there be an adequate demand to carry off the product, the output figure is bound to be below the optimum. This is at least true in the absence of a perfectly automatic adjustment of the number of workers to productive requirements. Recurrent periods of slack trade are, of course, part of the normality of modern industrial life, bringing with them recurring maladjustments of the labour supply to the shrinking demand. Collieries in the Australian coal industry, more especially in New South Wales, Queensland and Tasmania, are very familiar with the plague of intermittent trade, even though they have been more fortunate than those in most other countries since the war.

The losses of time through slack trade have had a serious effect in reducing the possible tonnage output per worker in the industry. In New South Wales, which may be taken as the index State, over the period 1920 to 1927 inclusive nearly 9 per cent. of the average annual number of man-days which could have been worked, but which were lost in idleness of collieries, were forfeited through "bad trade" conditions. This alone represents a loss of 53 tons per year on the possible output per mine-worker.[73] About 24 per cent. of the possible working time, or an equivalent of 151 tons per worker, has been forgone through all recorded causes reducing the number of working days. How far deliberate or conscious action on the part of both colliery managements and workers accounts for diminution of the possible output is more difficult of measurement. Possibly some share of the responsibility for losses attributed in official figures to "slackness of trade," "industrial disputes" and "other causes not stated," as well as that directly attributable to "meetings and extra holidays" and the closing down of work for a day on account of "deaths of employees," should be transferred to "deliberate restriction of output," not yet appearing in the official category of causes.

Trade conditions will at times, for instance, cause a company which operates two or more collieries to concentrate on the economies of the best and to close down temporarily the less productive. In a sense that is a deliberate act of restriction, but of operations rather than of output. The miners, for their part, seek to equalise opportunities for work among themselves by the imposition of the "darg." This is the device of setting a limit to the number of skips to be filled by each pair of men working on the coal face, so that the manager will not be tempted to feed more skips to the men in those parts where coal-getting is easier and relatively more profitable than to the men whose "cavil"[74] has allotted them the harder places. Such action may clearly restrict a maximum output of coal.[75]. But it is difficult to see that the motives inspiring both owners and workers in these deliberate acts are very different, or that the restrictions are to be condemned on economic grounds.

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[73] For the purpose of this calculation a possible maximum of 274 working days per year is assumed, viz., 365 days, less 52 Sundays, 26 Saturdays and 13 public holidays. This is approximately, the average figure upon which the N.S.W. Department of Labour and Industry's estimates of "working days lost" are based. The categories of causes and the absolute numbers of days lost referred to here, and in other parts of the text, are those published by this Department.

[74] The quarterly drawing of lots for working places.

In so far as stoppages are consciously provoked by tactics, either of incompetent mine managers[76] or of offended groups of workers in support of a reprimanded mate,[77] they are more truly to be regarded as sponsors for deliberately reduced output than are numerous disputes, in which thousands may become embroiled over some large question of disagreement between "capital and labour." The power deliberately to keep output per man at a conveniently comfortable level is also obviously at the disposal of men working on contract rates, and there is strong evidence that this power has been used.[78] Likewise, absenteeism, which is "practically confined to what are called contract men—miners, wheelers and machinemen—whose pay depends on piecework rates, and is almost negligible in the case of day wage men,"[79] comes within the category of deliberate causes of restricted output.

But there is no satisfactory quantitative measure of the effects of these causes. "Industrial disputes" at large, on the basis of published figures, were responsible in New South Wales in the period 1920 to 1927 for a possible average annual loss in output per mine-worker of 64 tons, suspension of work on account of "deaths of employees" for about three tons, mine employees' "meetings and extra holidays" for about two tons, and "other causes not stated" for about 13 tons. The remaining sets of causes described in official statistics, "truck shortage" and "mine disabilities," which were responsible over the same period for a shortening of the average annual output per worker by about 5 and 11 tons respectively, are much less within the voluntary power of those within the mines themselves to control, to the extent, at any rate, that some collieries must depend upon an uncertain supply of coal waggons from the State Railways and that in many collieries the management cannot anticipate every physical difficulty which may interfere with operations.

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[75] The President of the Northern District Branch of the Miners' Federation (Mr. T. Hoare) claims that the imposition of the "darg" has resulted in improved haulage arrangements in the mines. "The system of determining what the colliery was capable of hauling, fixing it according to the number of pairs of men it would run, and then refusing to fill any more than the determined number of skips, has thrown the onus upon the management; because, obviously, to get the output, arrangements have had to be made by way of grading, better roads, more horses, motor power, etc., to overcome the position." (Letter to the author.)

[76] "Mine managers certainly have a way of their own in stopping the colliery."—Representatives of employees at the Conference of Owners and Employees convened by N.S.W. Minister of Labour, Feb., 1928 (Minutes, p. 174).

[77] A very common practice, particularly among wheelers in collieries.

[78] E.g., Mr. (now Mr. Justice) J. L. Campbell, the Royal Commissioner in the enquiry of 1919, showed that in a number of collieries in the Northern District of N.S.W., although basic tonnage rates for miners had increased between 1914 and 1918 by percentages varying from 22½ to 31, the daily earnings of the recipients had increased by 1918 only to half what they "should have been . . . fairly conclusive proof that the miners, even while at the face, were not working up to their normal capacity . . . The miners, as well as the other employees in the Maitland collieries, were in 1914-1918 receiving a rate of pay that, even with a reduced working time, enabled them to make a sufficient wage without unduly taxing their energies." (Report, p. 38.)

[79] Campbell Report, p. 35.

The broad conclusion that seems to emerge from the foregoing discussion of the relationship of coal output to the labour involved in the Australian coal industry is that the maximum output of net utility which might reasonably be expected, with all the advantages at the industry's disposal, is still far from being achieved. This appears incontestable, despite the high relative output volume per worker for Australia as a whole, for which the extraordinarily high figures for the Western District of New South Wales and the Collie Field of Western Australia[80] are largely responsible. Indeed, without the contribution of these two fields, the average for the remaining Australian fields from 1920 to 1927 inclusive would be 393 tons, which is not so very much higher than that of South Africa.

It is perhaps here again necessary to remind the reader that to measure all the net economic utility which the industry exists to produce in terms of the coal output itself is by no means an adequate test of the social utility; and that the use of the term labour in the relationship discussed does not imply complete responsibility on the part of the manual workers. The contribution of some of the causes to the deficiency can be measured quantitatively, though only as an approximation, and that for one State alone; that of most of the causes cannot. In New South Wales, it was seen, were the former of these groups of causes not operating, the annual output per mine-worker might be greater by round about 151 tons. The accompanying graph (Figure III.) and Table VII. show striking inverse correlations between the curve of annual variations in the actual output per worker (A) and the curves of "total man-days lost through all (recorded) causes" (B), "man-days lost through industrial disputes" (m), and "man-days lost through unstated causes" (p). The coefficient of inverse correlation of the actual output curve (A) and the curve of man-day losses from all recorded causes (B) reaches the high figure of $-0{\cdot}901$. Curve A, of course, represents the output per worker after *all recorded causes* of loss have been taken into account. If compared with curve am, representing what the hypothetical output should have been,[81] were all causes *except disputes* taken into account, the correlation is seen to be direct and fairly marked, the coefficient being 0·77. Comparison with the hypothetical output calculated to include all causes of loss *excepting that attributable to slackness of trade* (curve an), gives an even more distinct, direct correlation, with coefficient of 0·92. These two latter correlations between actual and hypothetical outputs serve to show that both "disputes" and "slackness of trade," when each is taken apart from the other, as a cause of difference in output, are strong and persistent influences affecting the performance of the industry. It may be inferred from the coefficients of correlation that industrial disputes are somewhat more responsible for the variations in man-output than intermittency of trade. This fact is emphasised by comparison of the curves (m and n) of actual man-days lost through the respective causes. And the

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[80] "At Collie you may find a coal field where only one day has been lost in 13 years; where the output per man has reached a world record, and where owners and employees settle differences in a naive and gentlemanly fashion."—A special correspondent in the "Sydney Morning Herald."

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[81] On the basis of a possible maximum of 274 working days per year.

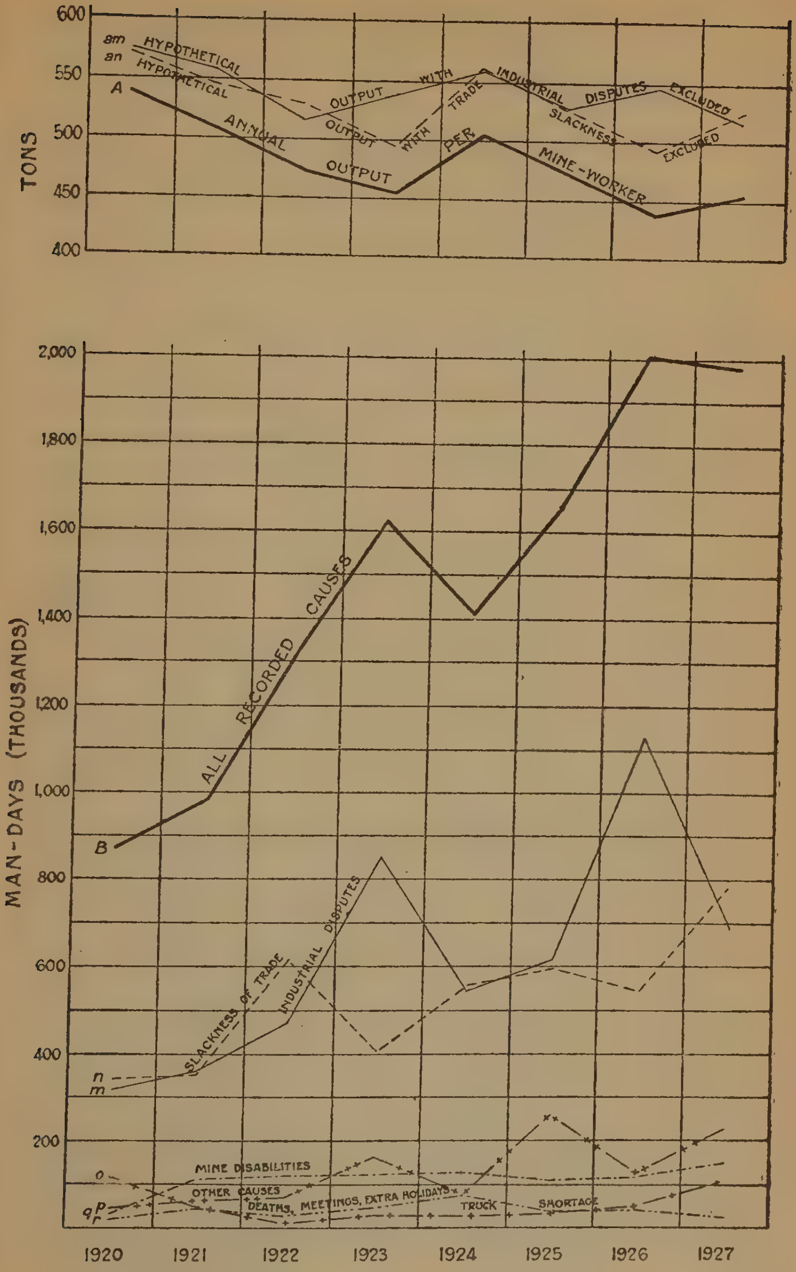

Figure III.—Annual Man-Output Curves compared with Curves of Man-Days Lost through Recorded Causes, N.S.W. Coal Industry.

TABLE VII.

CONCOMITANT VARIATIONS OF MAN-OUTPUT.

NEW SOUTH WALES COAL INDUSTRY, 1920–1927.

Year.	Possible Maximum Working Days. (a)	Average Number of Employees (b)	Possible Maximum Man-Days. (a) x (b) = (c)	Man-Days Lost Through All Causes Recorded. (d)	Man-Days Actually Worked. (c)—(d) = (e)	Actual Output per Mine Worker. (f)	Man-Days Lost Through Disputes. (g)	Man-Days Lost Through Slack Trade. (h)	Hypothetical Output with All Causes ex. Disputes. $(f)+\frac{(g)\ x\ (f)}{(e)}=$ (i)	Hypothetical Output with All Causes ex. Slack Trade. $(f)+\frac{(h)\ x\ (f)}{(e)}=$ (j)	Hypothetical. Possible Output on Basis of 274 Days per Year. $\frac{(f)\ x\ (c)}{(e)}=$ (k)
			'000s.	'000s.	'000s.	Tons.	'000s.	'000s.	Tons.	Tons.	Tons.
				Curve B		Curve A	Curve n	Curve m	Curve am	Curve an	
1920 . .	274	19,230	5,269	873	4,400	538	320	345	577	575	643
1921 . .	274	20,784	5,695	982	4,713	509	459	355	560	547	615
1922 . .	274	21,551	5,905	1,325	4,580	472	469	616	520	535	608
1923 . .	274	20,037	6,312	1,618	4,700	456	851	403	538	495	612
1924 . .	274	23,200	6,369	1,408	4,960	505	545	563	560	562	648
1925 . .	274	24,038	6,586	1,656	4,930	474	615	597	533	531	633
1926 . .	274	24,125	6,610	2,005	4,610	439	1,134	547	547	491	629
1927 . .	274	24,483	6,671	1,982	4,690	454	683	780	520	529	667
Average	274	22,181	6,177	1,481	4,698	481	635	526	544	533	632

obvious judgment must be expressed that the number of disputes, the magnitude of the numbers of idle days involved, and their tendency to increase,[82] all indicated in the curves as of major causal significance, are the less justifiable because the more readily preventable.[83]

All these correlations, however, useful as they are as far as they go, can tell nothing of the hindrances to a possibly higher output while the mines are working. It can at best only be hazarded that the group of factors which we have described as being most directly associated with technique are responsible to the extent of 90 tons for keeping the output ratio of the New South Wales section of the Australian coal industry below that of the United States. Both countries still enjoy the advantage of being able to operate under the law of diminishing costs "imposed by nature," and it is questionable whether Australian conditions as a whole are not superior to American. Yet the difference between the annual averages in long tons for New South Wales and the United States from 1920 to 1927 inclusive has been about 241. The average output per man-day worked for the two countries has been about 4.1 and 2.6 tons respectively. Were comparison made with the *possible* output of the United States, a still higher ideal of possible production might, of course, be set up for Australia. In the bituminous mines of the United States between 1920 and 1925 inclusive, the average number of days worked per annum was 176, but the possible maximum workable, according to the U.S. Bureau of Mines,[84] was 308. As the actual average annual output per mine-worker for this period was 665 long tons, the output hypothetically possible was 1,149 tons. Of the 132 days not worked, recorded causes are given for 116, and of these only between four and five are attributed to industrial disputes, the remainder to "no market, car shortage, and similar difficulties." It may be assumed that the 16 days unaccounted for, in which about 50 additional tons per worker, or a little over five per cent. of the possible maximum, might have been produced, are to be associated with the group of technical causes. In New South Wales, on the other hand, with measurable losses due to suspended work responsible for 151 tons per man-year, or 1.1 tons per man-day (by much of which the economic conscience of the Australian community is justifiably disquieted), about one-sixth of the possible output is forfeited by the technique of exploitation. Technicians in Australia, it will be thus seen, have still something to contribute of their ingenuity to complete economy in the working of the black coal industry.

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[82] E.g., of the total of 3,701 recorded industrial disputes in Australia from 1920 to 1927 inclusive, no less than 2,616 occurred in mining (nearly all coal mining). In N.S.W. the corresponding figures are 2,867 and 2,471, showing the predominant part played by the coal mining industry of that State in industrial dissidence in the Commonwealth. (See "Labour Reports," Commonwealth Statistician.)

[83] It should be added that the two causes are themselves mutually related. Sectional stoppages on the coal fields are in part responsible for declining trade; the intermittency of work produces unrest leading to stoppages.

[84] "Coal in 1925 and 1926."

III. The Winning of Brown Coal.

Should the operations of winning brown coal be regarded as part of those of the coal industry? So widely different are the techniques of black and brown coal in Australia, and in such marked contrast does the major enterprise in brown coal stand to the whole business of black coal exploitation, that to generalise upon the former in terms proper only to the latter would be highly misleading.

In what particular ways does this contrast arise? First of all, the total aggregate production of brown coal, itself a relatively inferior fuel, is very much smaller than the total annual volume of black coal, but is won by a single enterprise much larger in its capital expenditure and resources[85] than the largest colliery enterprise. This great Government undertaking, moreover, serves one major industrial purpose in electricity generation for a whole State and part of a neighbouring one, and a minor in briquette manufacture for what customers it may win for its product in the same territory.[86] Thus it operates for a market at once circumscribed and large, monopolistic and competitive. It wins its coal by a method nowhere practised in Australia in the getting of the black product. In strongest contrast to black coal mining, it exults in the "onward sweep of the machine process" and is in the van of the march. Its whole policy, indeed, is dominated by far-sighted planning and assiduous research into new possibilities. In Victoria, as in Germany and elsewhere, Prince Efficiency has come to woo the Cinderella among the coals, to the chagrin of the elder sisters. For economic reasons alone, if for no other, the black coal industry is being compelled by a disquieting fear to offer respect in place of disdain for its parvenu rival; and it is on economic grounds that the two must be considered together.

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[85] The whole undertaking by the end of 1928 represented a capital investment of about £11,500,000. Plans for extension immediately involve an estimated additional outlay of £2,806,000.

Ton for ton, brown lignite, of whatever grade, is less rich in useful qualities than any of its black elders in the family of coals. For that reason any physical difficulties which may happen to hinder its extraction are, economically speaking, more serious than equal obstacles in the getting of the poorest black coal. It is only when the extraction of the lignite is greatly cheapened by exceptionally favourable accessibility, aided by an expanding demand, which makes possible an increasing production, that its rivalry with black coal production becomes menacing. This fact is clearly demonstrated in Australia. Operations in Victoria, for instance, on brown coal within a few miles of Melbourne, but so far buried beneath the surface as to require deep mining methods, have been fitfully attempted and abandoned,[87] whilst others able to win the coal by a much cheaper process of stripping away a shallow "overburden" have lived a sickly existence on a small-scale output.[88] "The potential wealth of the brown coal fields," as one technical expert[89] truly comments, "has proved an elusive mirage for many small organisations promoted for their development." It was not until the resources of the State itself were seriously applied to the cutting of the most promising and extensive of the beds at shallow depth, on a plan that would ensure an adequate demand for the coal, that the concurrence of natural advantage and economical working was attained.

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[86] It should be stated, however, that the State Electricity Commission does not look on the market for briquettes as being confined to the State of Victoria. In the event of brown coal resources in the vicinity of Port Welshpool being developed, it is considered that both Tasmania and South Australia would become customers for briquettes.

[87] At Altona, a few miles south-west of the metropolis. Serious efforts are, however, being made at present to propound a scheme for the development of these deposits on a large scale.

The success of the State Electricity Commission of Victoria, the strong arm of the State which has been bent to the task, rests fundamentally on the economics of large-scale production. The State is prompted by the threefold urge to put to use its unique possession of the world's largest single deposit of high-grade brown lignite, to be less dependent on New South Wales fuels, and to give its industries an ample and cheap supply of electrical power. It may fairly be claimed that all three objectives are being achieved. For our present analysis, the third of these aims has the chief significance.[90]

As a principle it is broadly true that the supply of a commodity varies directly, though not proportionately, as the price. It is more nearly true to affirm of the present stage of brown coal exploitation in Victoria that the supply of the coal made available is *inversely* dependent upon the prices at which electricity and briquettes are sold. It is equally true that any downward movement in these prices to the consumer is dependent on the capacity of the Commission to increase its daily winning of coal. While applicable also to black coal and its derived products, the question of quantity production and of the inverse relationship of prices and supply is of the greater moment in the economy of brown coal extraction for the reason that, for a given expenditure of capital and labour, between three and four times the quantity of the brown product must be handled for a value equivalent to that of the black.[91] Thus, broadly, the more nearly possible it has become to extract between three and four tons of Yallourn brown coal at a cost no greater than extracting and delivering in Victoria one ton of New South Wales black coal, the more surely has the triple purpose of Victoria been realised. And the road to large quantity production of Victorian brown coal has been an effective State guarantee of a large demand for electrical power, an adequate expenditure on capital equipment, mechanised processes which relegate manual labour to a place of minor importance, and economies within the capacity of a control intelligently unifying many diverse operations.

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[88] I.a., at Lal Lal, near Ballarat (started in 1873), Wormbete Creek, near Wensleydale, Dean's Marsh, and even Morwell in its early stages (first privately from 1889 to 1894). The Mines Department operated the Old Open Cut at Morwell from 1916 until it was taken over by the Commission in 1924.

[89] F. H. Roberts: "Progress in the Development of Combustion of Victorian Brown Coal."

[90] We are not here primarily concerned with such obstacles to an increase in the low per capita consumption of electricity in Victoria as is represented by costly tariff-burdened electrical equipment. (See Sir G. A. Julius: Presidential Address to the Institution of Engineers, Australia, 1926, and Willits H. Sawyer: "Report on the Status and Affairs of the Electricity Commission of Victoria," 1926, Sec. 6.)

What pre-eminently distinguishes the technique of coal winning at Yallourn is the automatism of machinery with a fixed relation of processes. The application of automatic mechanisation is, indeed, proceeding so rapidly that a description of operations now will be out of date twelve months hence. It is this characteristic of brown coal winning in Victoria which stands out in such marked contrast to black coal operations elsewhere in Australia. Obviously, of course, cutting a soft coal "by the acre" under the open sky lends itself to a freedom in the use of mechanical aids not possible to a colliery. The "open cut" now being worked at Yallourn is, in effect, a giant pit some 2,400 feet long by 1,000 feet wide, in which coal is scooped from a face seventy feet deep. Even so, it is but a small hole in the ground of twenty square miles at the Commission's disposal to exploit. From it are drawn for the needs of power station and briquette factory a daily output of 6,000 tons.

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[91] "The ratio of brown to black coal for equivalent heat value varies, of course, with the moisture content of the brown coal. This moisture content is steadily diminishing, and has, through climatic exposure, fallen during the last three years from over 66 per cent. to under 63 per cent. As there is every expectation that it will fall still lower, the ratio of relative heat values can safely be stated as much more nearly 3 than 4."—Sir John Monash, Dec., 1928.

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The present equipment for cutting and hauling the coal is in part transitional. More effective means are progressively replacing less effective. Thus a bucket dredge has been added to the overburden removal equipment for the disposal of 6,500 cubic yards of overburden[92] in two eight-hour shifts as a substitute for an electric shovel capable of only 1,800 cubic yards; and trains of hand-dumped trucks of five cubic yards' capacity, drawn by steam engines which haul the material away, are replaced by automatically discharged 20 cubic yard trucks drawn by powerful electric locomotives. Even the heavy rail tracks on which the dredge moves, the removal of which would occupy a large body of men for a day, are shifted mechanically to a new position in the space of 20 minutes. A further attendant device is the large mechanical boom-stacker, which dumps and spreads the waste material.

At the coal face is an electrically driven coal shovel. Although an advance upon steam shovels used earlier, this apparatus is itself to be supplanted in 1929 by still more capable machines. A deep coal dredge is intended eventually to dig with an endless chain of buckets on a coal face 100 feet below a working bench, from which another dredge, of the scraper pattern, with an endless chain of teeth, will operate on a coal face above. The haulage of coal is likewise undergoing modification. At present a travelling apparatus, which receives the coal from the shovel, crushes, weighs and feeds the material to an endless procession of rope-hauled, gable-bottomed trucks, which automatically discharge into two hoppers. From one of these hoppers another rope haulage takes coal to the briquette factory, nearly a mile distant, and from the other a train of 20-ton trucks, drawn by electric locomotive, hauls to a modernised bunker, whence the coal, after further crushing, is delivered by belt conveyor to the power station or storage pile. This bunker, with its longitudinal slit at the bottom, and the revolving ploughs of the unloading machines which travel along its length, are the fruits of most recent ingenuity and typify the aggressive invasion of automatism. The transportation system is being adapted throughout to the most advanced German practice, so that eventually all rope haulage will be replaced by the electric locomotive, aided by gravitation on the steep grade from the working bench.

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[92] Of an average thickness of 28 feet.

The rapidly expanding demand on the Yallourn Cut for brown coal has presented the opportunity for such conversion of initial plant to most advanced Central European practice. But that alone does not explain the unique quality of enterprise at Yallourn. Advance planning of a time programme and careful installation and correlation of the new processes combine to infuse into the administration the hope of achievement and the spirit of adventure. Already the annual net balance of the whole enterprise has been lifted from the debit to the credit side of the ledger. With existing installation for coal winning of a daily production of 6,000 tons, the cost of delivery at power and briquetting plants is about 2s. 6d.; the cost in 1931, when the new installation already planned will be producing 10,000 tons daily, will be under 2s., and the operations firmly based on low cost economy.

Thus it will be seen that high mechanisation is emphasised as the condition of economic exploitation of Victoria's brown coal. The technique of operations is almost wholly of the German tradition and entirely abreast of its latest developments. In this respect, again, the contrast with black coal winning is very obvious, but perhaps not more so than in the importance of the place given to research in the two industries. Proprietors in the black coal industry in Australia have done little or nothing to endow independent research, as have proprietors in Great Britain,[93] but have been content to leave to Government Departments the little that has been done. As part of the whole scheme of brown coal exploitation in Victoria, the Electricity Commissioners, partly in conjunction with the State Railways Department, are vigorously prosecuting experiments in high and low temperature carbonization and in the drying and pulverizing of the coal and briquettes, as well as in the combustion of the raw coal by means of modifications in furnace grate design. In addition, at least one British enterprise is proposing the application to Victorian and South Australian brown coals its methods of low temperature distillation with, at all events, the prospectus-promise of cheap petrol, oils, wax, resins, town gas and residual fuel.

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[93] Coal owners in Great Britain have, for instance, for many years supported the Birmingham University Mining Research Laboratory, some having contributed over £100,000 to the general university funds. (Dr. J. S. Haldane, in evidence before the Royal Commission, 1925, twenty-second day.)

The Electricity Commissioners, with a thorough knowledge of the economic problems involved, are, although eager for results, commendably cautious. Their tests indicate that carbonization of Yallourn raw wet coal is technically and economically unsound, that predrying is essential, and that the carbonizing of briquettes cannot be considered as competitive with bituminous coal unless the price paid by gas works in Melbourne for briquettes were somewhat less than 70 per cent. of what they pay for Maitland coal. Production costs at Yallourn do not at present permit this price concession. Provided, however, that a satisfactory market could be obtained for the char or coke residue, there is no technical reason why dried brown coal or briquettes should not be carbonized in vertical retorts and the gas distributed to consumers after the removal of the high percentage (30) of carbonic acid.[94] It is a question, in view of successes in America, whether the economic solution will not lie in long-distance pipe transmission of the gas from Yallourn to the metropolis.

The experiments in pulverization in co-operation with the State Railways have revealed a complication in the economic problem. No difficulty is found in either drying the brown coal or in pulverizing it after drying. In stationary boilers the pulverized material gives most satisfactory results in operation, steaming capacity, flexibility in steaming, and economy of calorific power. If prepared on a substantial commercial scale, it is claimed, say at not less than 200,000 tons per annum, heat in pulverized brown coal form could be supplied to Melbourne boiler houses cheaper than it can at present be obtained from black coal.[95] But for locomotives, although the pulverized fuel gives an efficiency of combustion even higher than that of lump black coal, certain practical problems of locomotive operation are, as yet, a barrier to its adoption. The possible cost economies of larger scale operation are here an inducement to the Electricity Commissioners to bring the possible fuel costs of the Railway Commissioners to a level sufficiently low to compel solution of the locomotive difficulty.

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[94] R. E. Thwaites: "Experimental Carbonization of Brown Coal and Brown Coal Briquettes," Bulletin No. 2 (1927), State Electricity Commission of Victoria, pp 29 and 30.

Finally, the experiments in the combustion of raw brown coal have been exhaustive and ingenious. The necessity for speedily adapting a power-house boiler plant constructed originally for the burning of brown coal of from 45 to 50 per cent. moisture to supplies found to contain 65 per cent. of water was a challenge which the ingenuity of the Commission's engineers has met triumphantly. Briefly, the difficulty overcome was the retention of a travelling type of grate, suitable in itself only for the drier coal, and the devising and installing of a supplementary pre-drying device internal to the furnace. The first researches in this direction led to the partial adoption of "driers" as parts of the boiler plant, but external to the furnaces proper, by means of which hot waste flue gases contributed the necessary pre-drying heat. These "driers" solved the major economic problem, but did not overcome such difficulties as excessive loss of draught and fine coal dust, and irregular coal and gas flow. Subsequent experiments have led to the substitution of auxiliary step grates, first of a fixed, later of a moving type, which expose the coal to heat by radiation and conduction after it enters the furnace, but before it is fed on to the travelling stoker. For various technical reasons of economy, it is proposed in further boiler-house extensions to adopt certain improvements upon this mechanical grate.

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[95] H. Herman: "The Newport Experimental Drying and Pulverizing Plant for Treatment of Brown Coal," Bulletin No. 1 (1926), State Electricity Commission of Victoria, p. 32.

The conclusions to which the whole technique of brown coal winning in Victoria invites the judgment of the investigator are decidedly favourable. Here is no laggard or haphazard industry. If human ability could master the handicap "imposed by nature" in offering abundance of low-grade fuel, it was to be mastered in Victoria. Fortunately those to whom the State has committed this responsible charge cherish no illusions that the solution of the problems which are called technical can be dissociated from those which are called economic.

CHAPTER IV.

HOW THE INDUSTRY IS ORGANISED.

I. THE COAL OWNERS AND THEIR AFFILIATIONS.

The existing structure of any industry is but the latest phase in an historical process of experiment in organisation. To be completely adequate, an analysis of the present operations and control of the Australian coal industry would, therefore, demand careful enquiry into the chronology of a hundred and thirty years of not uneventful industrial history. Such a detailed enquiry is beyond the intended scope of this book. It is important, however, that the evolutionary aspect of organisation should be stressed, as much for the check which it puts upon hasty criticism as for the hope which it suggests for a better future. Necessary as this emphasis is, it is even more important to recognise, once again, the formative influences of physical environment. Foremost among these has been the influence of geography, itself the unchanging *milieu* within which the events of history move.

Thus back of the dominance which a minority of the coal enterprises of New South Wales have been able for long to exercise over the Australian market, are geographical and historical factors. Geographically the predominant groups have been favoured as much for their purpose of concentrating control as they have for the relatively cheap transport of their product to the markets. Historically coal production in New South Wales was able for three-quarters of a century before coal mining reached noticeable proportions in other States to accumulate large capital resources from its own successful operations.[1] Up to 1875, with the exception of the large Australian Agricultural Company financed with

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[1] The commercial production of coal began in 1797, the year of the discovery of the Hunter River and the site of Newcastle.

English funds, the enterprisers in coal in New South Wales were individuals, partnerships and small private companies. Since that date, and more especially from the beginning of the 'nineties, with the opening up of the rich Greta seam of the Maitland field, the greater part of the coal production of the State has tended to come from a minority of large joint-stock companies.[2] Since 1901 the collieries of most of these large concerns have spread thickly along a narrow strip of territory 25 miles south-west of Maitland. This region has as a result already developed into what is normally a busy industrial district of 45,000 people.

The same tendency to concentration of output in larger enterprises is observable in other districts of New South Wales and in other States of the Commonwealth, though not so markedly. All seven operating collieries in Western Australia, with a not inconsiderable aggregate output, are, with one exception, in one private ownership. In Queensland and Victoria it has been the State which has taken the leading part in large-scale production. Concentration of production and ownership, however, is most outstanding in New South Wales. In Australia in 1927, 43 collieries, or a little over one-sixth of the total which produced coal, had an output of over 100,000 tons each. These together accounted for 70 per cent. of the national production and the 39 of them within New South Wales for 62 per cent. This shows a considerable concentration of production in large collieries, but indicates also, of course, a large margin of small collieries existing to share the balance of the national output.[3] Concentration of ownership, however, is even more the distinguishing characteristic of the New South Wales industry. The following table summarises the position in 1927:—

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[2] A notable surviving exception is the large family proprietary enterprise of J. & A. Brown.

[3] The further significance of this fact is elaborated in Chapter VII.

TABLE VIII.

CONCENTRATION OF OWNERSHIP, N.S.W. MINES, 1927.

District.	Number of Owners.	Number of Mines.	Proportion of Output of District.	Proportion of Output of State.
			Per cent.	Per cent.
Northern	12	27	80	53
	11	11	10	6
Western	11 (*a*)	15	95	15
Southern	12 (*b*)	13	98	19
Total ..	43	66	93	93

(*a*) Includes two also included in Southern.
(*b*) Includes one also included in Northern and two in Western.

Thus the 43 owners of half the mines operating in New South Wales in 1927 (there were 140 in the State with some output) were responsible for 93 per cent. of the output of the State or, in terms of national production, for 76 per cent. of that of the Commonwealth. Twelve owners alone in the Northern fields accounted for 53 per cent. of the State total, or for upwards of 43 per cent. of the national total. The analysis carried still farther shows that the two largest companies,[4] owning respecively eight and four collieries, between them produced 22½ per cent. of the State total or 18 per cent. of the Commonwealth total. When the further fact is stressed that the figures in the Table refer to organisations which are only ostensibly separate, and that close examination of share lists would probably reveal appreciable interconnection, it will be realised that there exists a very considerable concentration of ownership and control in the industry.

The interlocking of other industrial interests with those of coal mining has long intrigued the suspicions of the Australian consumer, and has at least once in the political history of the country been a subject of excited controversy in and out of Parliament. It has been the growth of a strong organic relationship of coal mining and Interstate shipping interests which has aroused the public fear of monopoly. Undoubtedly this is the most significant of the tendencies to corporate amalgamation which have appeared in the coal industry, but it is not the sole symptom of the movement towards concentration of industrial control. Horizontal combinations of separate colliery concerns, the vertical intrusion of iron and steel works into colliery ownership, and what might be called the "circular"[5] combination of colliery enterprises with cokeworks, brickyards, power stations and railways, all of these either by way of amalgamation of separate existing concerns or the development of ancillary enterprises, have in some small degree manifested themselves. The combination of coal mines with brickyards or cokeworks is a common form of unified ownership, more especially in the Southern and Western Districts of New South Wales, and of mines with cement works in the Western District. In the Northern District some colliery enterprises either directly own or have large investment interests in lines of railway.[6] Of the two large iron and steel works operating in New South Wales one[7] draws coal from two mines within the boundaries of its own plant, as well as from a mine in another district, and the other[8] has two coal properties in an advanced stage of development a few miles from the steel works themselves.

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[4] The Caledonian Collieries Ltd. and the Abermain-Seaham Collieries Ltd. The collieries of the former produced 13 per cent. of the quantity hauled by rail; those of the latter 9½ per cent.

It is, however, the interconnections of coal and shipping which exemplify the most effective forms of concentration of control. These organic connections arose out of the competitive stress of falling prices which accompanied the expansion of the Maitland field after 1901. The dislocation of strike disturbances in 1887 and 1890 and the financial crisis of 1893 had caused a temporary loss of part of the coal export trade of New South

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[5] A phrase coined by Mazur: "The Causes of American Prosperity" (1928).

[6] E.g., the enterprise of J. & A. Brown owns 23 miles of railway as well as four large collieries, an engineering works, and colliers and tugs. The investments of the East Greta Coal Mining Company are mostly in the South Maitland Railways Ltd.

[7] Australian Iron and Steel Ltd., at Lithgow and Wongawilli.

[8] The Broken Hill Pty. Coy. Ltd., at Newcastle.

Wales and a depression in local industry. By 1897, however, a recovery had been made and, although Interstate trade grew but little, local consumption and overseas exports of coal grew rapidly. Up till the end of the century the three New South Wales coal districts shared about equally in the expansion, but from 1901 the Northern became the most active, and by 1906 was producing 70 per cent. of the State output. The year 1901, however, marked the downward turning point of the rising tide of coal prices. From 8s. 4d. per ton at the pit in 1901 the price fell sharply until the average reached in 1906 was 6s. 5d. Although concurrently the total State production and the output per employee increased in both quantity and value, the earnings of the coal companies on the one hand[9] and of the miners (whose rates moved on a sliding scale in accordance with coal prices) on the other[10] were becoming sorely depressed. The ascendancy of the rich Maitland field as a new source of competitive supply was not to be achieved without profoundly disturbing results to the entire coal industry. Proprietors and employees alike turned aggressively to measures which might consolidate their defences in the confusion of the readjustment. The section following will briefly trace the influence of this period upon the policy of the miners' organisation. So far as the owners were concerned there resulted in 1906 the formation of the Coal Vend and a shipping agreement for the allying of the more important of the Northern collieries and Interstate shipping companies in price stabilisation. In this move towards an effective monopoly control of price by a sufficient number of Northern mines, the linked gains to coal proprietor and Interstate shipping company arising from a mutual engrossing of coal transport and coal marketing were quickly evident. When the

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[9] The average dividend paid by companies which published their accounts was 3.7 per cent. in 1906, as against 5.1 per cent. in 1901. (Nash: "Australasian Joint Stock Companies' Year Book," 1901, 1907 and 1912.)

[10] On the Northern fields the hewing rate for the best coal fell from 4s. 2d. per ton in 1901 to 3s. 6d. in 1906. The average weekly earnings of miners on contract rates fell from 67s. to 52s., and the weekly wage rate for wheelers from 42s. to 38s., over a period when the predominant wage for unskilled labour in other non-rural industries rose from 35s. to 42s. per week. ("N.S.W. Statistical Register," 1920-21, p. 588.)

Vend was dissolved in 1912 after legal proceedings by the Commonwealth Government on grounds, under the Australian Industries Preservation Act, of combination detrimental to the public interest, the way of safe as well as effective monopoly[11] had already been shown. This lay along the road of direct organic relationship between pairs of large coal producers and purveyors of shipping. The arrangement consequent on the dissolution of the Vend replaced the relationship of shipping companies as mere selling agents, but it made possible the retention between the several composite organisations and concerns still solely coal-producing of an association sufficiently loose to ensure reasonably certain stabilisation of price without complete elimination of competition for business.

It was after 1912, therefore, that the present grouping of shipping and coal companies really began. As far as can be readily ascertained, the most important of these bracketed interests control about two-thirds of the Northern District output. If the tonnages of coal hauled by the State railways during 1925-1926 for the respective enterprises be accepted as a reliable measure of proportionate output, it is seen that the Australian Steamships Ltd., which is connected with the Caledonian Collieries Ltd. through the holding company of Howard Smith Ltd., facilitated the marketing[12] of 24 per cent. of the Northern output; the Adelaide Steamship Co. Ltd., which is largely interested in the Abermain-Seaham Collieries Ltd. and the East Greta Coal Mining Co. Ltd., of 22 per cent.; Huddart Parker Ltd., controlling Hebburn Ltd.,[13] of 8 per cent.; J. and A. Brown, owning its own mines and shipping, of 8 per cent.; and McIlwraith, McEacharn Ltd., connected with Hetton Bellbird Collieries Ltd., of 5 per cent. The coal enterprises concerned, except Greta Main, are all included in the group of twelve large owners shown in Table VIII. It is obvious that the organic union of colliery companies with shipping enterprises which vend the bulk of the coal sold on the Interstate markets gives the former, under normal conditions of demand, at once strong protection from uncertainties on the competitive fringe of sales and the power to set the price for the greater part of the coal upon which the Australian community depends.

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[11] A monopoly may, of course, be effective if only from 60 to 70 per cent. of an absolute monopoly.

[12] Actual analysis shows that there was little apparent exclusiveness by shipping concerns in handling the coal of their own associated and other collieries.

[13] The minority shares held by the Australian Agricultural Coy.

The entrepot sea carriage of coal along the coast of New South Wales (from North and South to Sydney), which is done mainly in colliers owned by colliery and/or coke businesses, has less significance in itself for price control, but the enterprises concerned are for the most part linked in the arrangements by which more or less effective check is put upon the force of blind competition in the sales of coal from the various fields. For the evolution of controls in the coal business has not stopped with the inter-connections on the Northern fields of New South Wales already discussed. Defensive organisation among the coal owners in several States has taken two forms: one against the vagaries of demand and price, the other against the organised pressure of employees.

In the Northern District of New South Wales the most powerful of the coal companies depend for the protection of their trade interests upon their shipping affiliations, but not entirely so. Through their membership of the Northern Collieries Association, which is primarily an industrial union of employers presenting a strong front to the Colliery Employees' Federation, they are able to act in concert with lesser, but still large, coal producers in a common price policy. The twenty members of this Association own 40 mines in the North, employ 11,600 men, and together produced nearly 86 per cent. of the total tonnage drawn from the Northern District in 1927, the balance being the aggregate output of 53 non-members. The Association does not perform any of the functions of a selling agent for the members and has none of the coercive machinery of a cartel at its disposal to ensure the adherence of its members to the accepted price policy. The common bond which has so far effectively held together both great and small, has been high price maintenance on the naturally protected Australian market, to which the Association's members are the chief purveyors; but evidence is not wanting that the great slump in demand during 1928 has provided a sore temptation to some members to win business by withdrawal from membership and cutting of prices.

In the Southern and Western Districts of New South Wales there exists more complicated machinery for collective defence. In both districts marketing organisations operate independently of separate industrial organisations; and the marketing machinery in the two fields is actually unified organically, in respect of the metropolitan market, through a special trading company. On the Southern field nine of the largest owners are associated in an industrial union of employers known as the Southern Coal Proprietors' Association, and on the Western seven owners are associated in a similar union, called the Western Coal Association. On both fields these groups represent the largest employers of labour, in which capacity they have strong common interests. But in respect of trade the same strong common interest does not obtain. Hence only five of the owners in the south are members of the Southern Coal Owners' Agency and four in the West members of the Lithgow Coal Association. While it is true that the former of these agencies does not control the sales of half the Southern output, its members are among the largest producers on the field. The five largest collieries operating independently produce somewhat more than the aggregate handled by the Agency. Likewise only four owners are members of the Lithgow Coal Association, but together they produce more than do the remaining sixteen commercial collieries. In addition, but separate from the collieries of the Association, four mines associated with iron or cement works, and having about half the aggregate output of those of the Association, and the State colliery, with a little more than half, are operating in the West. With one or two exceptions the mines of the Lithgow Coal

Association are approaching the end of the coal accessible from their present workings. They are also facing the formidable price competition of the non-members whose mines, of more recent origin, are situated up to 20 miles west of Lithgow.[14]

Both these selling organisations have in the past been in a position "to exert a powerful influence on both production and trade in the coals of their respective districts."[15] As an important part of the natural trade of each lies in the metropolitan area of Sydney, in which the Teralba group of Northern collieries is also a competitor, the Southern and Western Agencies conduct a limited liability company (B. Byrnes Ltd.), the shares of which are held in equal aggregates by the Lithgow Association as a body and, in the total of their individual holdings, by the members of the Southern Agency, this Agency itself and certain individuals also holding nominal share interests. Royal Commissioner Campbell pointed out as far back as 1919 that this joint organisation was sufficiently powerful to make it difficult for any single outside competitor to acquire or maintain a secure position in the metropolitan market without the practical concurrence of the company, and that in view of an apparent arrangement qualifying the competition of the Teralba group, the public interest was by no means safeguarded.[16]

In other States defensive organisations among owners have not played the formidable part of those in New South Wales. In Queensland the private enterprisers in coal are organised primarily as employers in the Queensland Colliery Proprietors' Council. Small experiments in selling organisation, such as the dual marketing arrangement of "The Coalfield Agency (Blair Athol) Ltd.," have been tried, but do not appear to have embraced any considerable grouping of collieries. In Victoria and Tasmania only loose understandings link the competing concerns where their interests merge, whilst in Western Australia, where practically all the operating collieries are in one ownership, conditions are not yet ripe for associative action of any sort.

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[14] In 1928 the Lithgow Coal Association for the first time on record failed to secure any large part of the large contracts for railway and electricity coal, which forms the staple market for the Western output. This was also due in part to the increasing output of the State Mine, operated for the Railway Department.

[15] Campbell: "Royal Commission Report, 1919," p. 45.

[16] "Royal Commission Report," Ibid, p. 46. He pointed out that the prices charged just prior to 1919 did not appear to be fully justified.

The evidence of experience appears to lead to two conclusions. The first is that over the area throughout which the bulk of coal is sold in Australia, despite the existence of several apparently distinct associations comprising a numerical minority of owners, and despite a real competitive activity for the available trade, the artificial maintenance of a high-price policy has been possible and has been chosen by the major interests, even at the cost of much intermittency of operation.[17] Undoubtedly the repeated stepping upwards of prices has had its most direct cause in the pressure of the mineworkers for improvements in living and working standards always somewhat in advance of those in other industries; but it has nearly always been possible to pass these added costs—and sometimes something more[18]—on to the price of coal.

The second conclusion is that the outstanding employers' industrial union in the industry—the Northern Collieries Association—is an effective focal organisation for the colliery owners generally in their collective dealings with the strongly centralised employees' organisations. This perhaps is in noteworthy contrast to conditions prevailing in the United States, where there is no single unit which can represent the independent "operators' associations" in formulating a labour policy for bargaining with the close-knit organisation of the employees.[19] On the other hand, the strong strategic position of the Northern Collieries Association is only partly comparable to the strength of the Mining Association in the United Kingdom, which can offer a unified front to the loosely federated Miners' Federation of Great Britain.[20]

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[17] And, it might be added, the toleration of badly or extravagantly run collieries as preferable to a price-cutting war, which would leave only the most economically run mines in operation.

[18] Mr. Justice Campbell e.g., in his 1919 Report, states that "the increased selling price introduced by Mr. Justice Edmunds' order of December, 1916 (Order No. 3 of the Coal Board) was not wholly absorbed by the increased cost of production in the period following the Order (Report, p. 15). He points out that later increased costs nullified this advantage to the owners somewhat. The same phenomenon appears to have occurred following the Federal Government's increase of 4s. under the War Precautions Act in 1920. Mr. Justice Campbell, in 1919, had also occasion to comment adversely on the noteworthy fact that "when an increase in colliery prices occurs, the prices in the successive stages of distribution to the point at which the coal reaches the consumer, expand far beyond the measure of the initial increase." (Report, p. 48.)

Extreme difficulty faces the investigator who seeks to get a satisfactory understanding of the capital basis of the industry and to make clear the structural aspects of coal-mining finance. In the one serious public attempt to do this in New South Wales,[21] even though the proprietors permitted scrutiny of their books on the understanding that the information disclosed would not be made public in such a way as to reveal the names of the collieries concerned, the Royal Commissioner sought to estimate the extent only of the capital, without book enhancement of values, actually employed in productive operations. Partly as a result of revaluations in a number of reconstructions, and partly because of accounting methods which did not distinguish capital expenditure on colliery, railway and general trading operations, the Commissioner was compelled to state that to make even an approximate estimate of the actual capital investment was attended with much difficulty, and, in some instances, the attempt to estimate such investment in relation to production, even approximately, had to be abandoned.

In the case of reconstructions and absorptions by purchase it appears that, generally speaking, the nominal value of the paid-up shares issued by the new companies has, at the date of the transaction, been greater than the total market value of the tangible assets acquired. This practice, together with that of increasing nominal capital by the issue of bonus shares credited to the recipients as wholly or partly paid up, obviously vitiates the meaning of the nominal capital resources upon which a number of colliery enterprises ostensibly depend, as well as of the

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19. Lubin: "Miners' Wages and the Cost of Coal," pp. 41-42.
20. S. O. Davies in the English "Highway," January, 1928.
21. The Campbell Royal Commission of Enquiry, 1919.

published rates of dividend. The history of coal companies in New South Wales has shown an increasing tendency to these reconstructions and substantial issues of bonus shares out of previously undisclosed reserves. The significance of this tendency in respect of profits is dealt with in Chapter IX.

It would appear from the Campbell analysis that the capital employed by individual collieries of any significance in New South Wales in 1918 ranged between about £5,500 and £337,000, with an average over all districts of £126,000. But as the larger collieries are grouped for their operation with considerably higher aggregate resources, these relative figures are of little significance in indicating the scope of performance as between mines. Of greater interest, perhaps, is the constituent basis of the capital resources of the industry, and for this purpose published balance sheets, although not a completely reliable index, have a value.

In a careful analysis of the published balance sheets of sixteen of the larger coal companies in New South Wales, Mr. F. V. McGee[22] has shown that the proportion which shareholders' funds bear to those from outside sources in the total of liabilities and assets (the total available capital) is roughly 87 per cent. Of these shareholders' funds nearly nine-tenths (87 per cent.) represent paid-up capital (itself being made up of 82 per cent. ordinary, 9 per cent. preference, and 9 per cent. bonus), the remaining 13 per cent. undistributed profits (themselves made up of general reserves 52 per cent., contingency reserves 20 per cent., balance brought forward 6 per cent., and dividends unpaid at balance date 19 per cent.). Of the outsiders' funds (13 per cent. of the total available capital) interest-bearing debentures, mortgages and bank overdrafts account for 30 per cent., and non-interest-bearing credits about 70 per cent. From this analysis it would appear that coal-mining enterprises in New South Wales are among those businesses which do not (and perhaps cannot because of the nature of their assets) have recourse to capital resources outside those supplied by share subscribers. Even undistributed profits as a source of working capital in coal mining appear to be below the average for business in general.[23] Mr. McGee's investigation showed that 86 per cent. of the assets of the mines concerned was property and plant.[24] To what degree the valuations of freeholds and leaseholds[25] comprise these property assets it is impossible to say, but it is clear that a great part of the capital used in coal mining is sunk in equipment underground and above ground which cannot readily be liquidated. This fact, as will be shown in Chapter VII., is highly significant in the central problem with which the industry is faced.

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[22] F. V. McGee, M.Ec.: "Australasian Business Finance" (article in the "Economic Record," November, 1927, to be amplified in a book to be published).

Despite the degree to which concentration of ownership and control has already proceeded in the Australian coal industry, and the extent of the supplementary measures taken through collective agencies for the control of the coal trade, it is evident that there is to-day, in the sum, no more effective co-ordination of the forces that make for general welfare in the industry than in the situation deplored in the report of the Royal Commission of 1919. The net effect of the pursuit by strong sectional interests of a policy directed to the maintenance of a price always automatically movable to embrace each new increment of cost[26] has not been to stabilise conditions in the industry. It has induced rather than prevented an influx of unneeded enterprises into coal production. In other words the Australian black coal industry presents the spectacle of monopoly caught napping. It has been content lazily to enjoy the benison of a sufficient price without shouldering the sacrificial task of a "rationalisation" of the productive and marketing processes which drive up costs for the whole industry. By not venturing far enough in organisation it has, in its own despite, permitted in the industry what Professor MacGregor would call an over-supply of organisation.[27] That is surely part of the meaning of a large number of mines and some 24,500 men employed for only about two-thirds of their time, and of an industry burdened with a heavy excess of under-employed capital.

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[23] 10.5 per cent. of all funds held (in Mr. McGee's selection), as against about 20 per cent. for the 619 business concerns of all kinds coming under his examination. The proportion of undistributed profits for ten metalliferous mining companies examined was no less than 37.7 per cent.

[24] "Property," as distinguished from "plant" (machinery), apparently embraces such equipment as freeholds, leaseholds, railways, locomotives, coal waggons, buildings and horses.

[25] About three times as much Crown leasehold land as private leasehold and freehold land is used in N.S.W. The area of private land being exploited is increasing relatively to that of Crown lands.

[26] Such as increased wage rates or railway freight charges.

II. THE COAL MINERS AND THEIR AFFILIATIONS.

The defensive organisations built up by the employees of the industry are of equal importance with and possibly of greater significance than those of the coal owners. The Australian coal industry is, for its size, more effectively unionised than that of any other country. By far the most important organisation of workers in the industry is the Mining Department of the Workers' Industrial Union of Australia or, to give it its older and more popular titles, the Coal and Shale Employees', or Miners', Federation. The significance of the longer and newer name lies in the acceptance by the miners of their place in one of the departmental divisions of the proposed One Big Union, which has for many years been preached, until now ineffectually, by the "industrial" wing of the Labour Movement. As the present name suggests, the organisation embraces miners both of metals and coal, but the coal-winners predominate by a nine to one majority.

The official name further signifies the desire to embrace all employees associated with mining throughout the continent in a single organisation. But craft obstructions have so far frustrated the accomplishment of this objective. At least half a dozen smaller organisations of skilled workers are represented in the industry. The most important of these are the Colliery Mechanics'

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[27] "The supply of goods by any one industry is not under the conscious and central control of any one director, and therefore the contest which is carried on by each for itself results in an 'over-supply of organisation.' "—"The Evolution of Industry," pp. 196-197.

Mutual Protective Associations of New South Wales and Queensland and the Federated Engine Drivers' and Firemen's Association, with about 1,400 and 1,000 members respectively in New South Wales alone. In New South Wales the Amalgamated Engineering Union is represented by between 400 and 500 members. Deputies and Shot Firers have associations in the Newcastle District and on the Southern and Western fields; Colliery Officials on the South Maitland and Southern fields; and a United Collieries' Staff Association embraces 360 members throughout the State. These service crafts are not so completely organised in the other coal-producing States.

The Miners' Federation comprises a membership of 28,123 throughout Australia, and embraces practically all types of worker not covered by the service craft organisations enumerated above. For administrative purposes the membership is grouped in five districts—North (14,128), South (4,280), West (2,083), and the Barrier or Broken Hill (3,314) in New South Wales; one covering all Queensland (2,556); and one embracing Victoria and Tasmania (1,762). The coal miners of Western Australia (about 500) are organised into their own separate union, with which negotiations for absorption have been for some time, but so far unsuccessfully, conducted by the Federation.

The Northern District Branch in New South Wales, as might be supposed, exercises the dominating influence in the counsels of the Federation, but each Branch enjoys considerable autonomy. The real unit of the organisation is the "lodge."[28] Thus the Northern District Branch is comprised of upwards of 50 lodges, a lodge in most cases itself being composed of all the workers (except the relatively few in other craft organisations) connected with a colliery. Lodges therefore vary in the size of their membership with the scale of operations of the collieries. One may have no more than 30 members (Rhondda); another as many as 700 (Aberdare Central). The business of the lodge is to deal with matters affecting its members which arise in connection with its own mine and to refer to the Federation officials in cases of impasse.

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[28] For the District of Victoria and Tasmania it is the "branch," corresponding in function to the N.S.W. "lodge."

The frequent recourse to change in the internal structure of the Federation illustrates the difficulties of administration for economic defence. The governing authority is the Central Council, comprised of 14 councillors, five of them from the Northern District, the remainder from the other District Branches.[29] For the North there has long existed a body as the District counterpart of the Central Council. It has usually gone by the name of the Delegate Board,[30] and, during most of its history, comprised at least one delegate from each lodge. But the cumbersomeness of such representation, its cost,[31] and the opportunity it always offered for time-wasting loquacity and ineffectual discussion, have from time to time moved reforming spirits to action. Between 1902 and 1908 a standing committee of management was empowered to transact ordinary business, with the Board itself meeting quarterly for revision and matters of finance. This quasi-oligarchic arrangement, however, finally fell before the attacks of suspicious democrats, and the plenary powers of the Board itself were restored. In recent years the claims of economy have again become paramount. For a brief period after June, 1924, an innovation in the grouping of lodge delegation was tried, a group comprising from four to seven lodges associated geographically. Thus the Aberdare group was made up of four lodges and a total membership of 2000; the Greta group, also comprising four lodges, of not more than 800 members. Each lodge had two representatives in a local group committee, which in turn corporately appointed a delegate to the "Group System" which replaced the Board. But unfortunately for the happy working of the new arrangement, it had necessarily to eliminate a number of ambitious delegates of the old Board. The scheme failed to become popular in the individual lodges,[32] and mass opinion was soon swung back to a plebiscite vote for restoration of the old arrangement.

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[29] Western District 2, Southern District 2, Broken Hill 2, Queensland 2, Victoria and Tasmania 1. The General President and General Secretary are, ipso facto, members of the Central Council.

[30] The Southern and Western Branches have similar Boards.

[31] Anything from £40 to £100 for each day of meeting.

The most recent step has again resulted from considerations of finance, and presents an interesting *volte face.* There has probably been no severer year than 1928 in the history of the northern miners. The husbanding of the Federation's funds at a time when revenue was fast dwindling compelled the Delegate Board to seek even its own dissolution.

In March, 1928, the Board decided to recommend to the Central Council a reversion to the older form of management committee in the North, with regular meetings once a quarter only and a membership of seven,[33] exclusive of three executive officials of the Federation. The decision further involved a determination of the economising northerners to have the Central Council itself abolished and replaced by a governing authority composed of two members of the executive of each district. Representatives from other Branches on the Council, however, opposed the change. A special convention of the Miners' Federation held in Sydney in June among other decisions resolved to submit the question to a plebiscite of the general body of members, who later by their vote refused to endorse the constitutional change.

The relations between lodges and the Federation executives, both Central and District, and sometimes between Districts and the whole Federation, are a source of many administrative dilemmas. The still persistent habit of local mining groups precipitating stoppages which frequently implicate executive action, contrary to the best judgment of the Federation officials, prevents a policy of self-consistent action by the Federation, kindles vexation, and wastes both time and funds. Up till June of 1928 it was within the rights of the members of any local lodge involved in a stoppage to receive strike pay from the Federation funds from the first day of ceasing work. This provision encouraged such a scandalous outbreak of irresponsible local strikes that the June Convention had to seek the protection of the Federation's funds by abolishing strike pay for the first two weeks of a dispute and by reducing the pay for all strikes. It is significant that this decision was forced by a threatened break-away of the Queensland District. Whenever a dispute arises in a colliery it is the responsibility of local lodge officials to endeavour to settle it within three days, after which it must be referred to the District executive.

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[32] "It is being sabotaged," said Mr. T. Hoare, President of the Northern Branch, in 1925. He complained bitterly of the "game of ins and outs" which some of the men seeking representation from the lodges were playing, indicating that they regarded any proposal for the better administration of the organisation from the standpoint of their own personal interests.

[33] Three elected by the general body of Northern Branch members and one by each of the four Groups into which the Branch is divided for the purpose. The four Group delegates and the Northern District President are the Branch's representatives on the Central Council.

Finance and discipline are central to the whole problem of administration in the Federation, although a disproportionately large degree of attention is given to the form and basis of government. The organisation's finances are based primarily on the annual subscriptions of members, which are thirty shillings for the adult and half that amount for the boy worker.[34] These subscriptions, together with the special levies for the support of strikes or for maintenance during lock-outs (as in 1929), both in Australia[35] and sometimes abroad,[36] and of a labour newspaper,[37] are paid into the central funds of the Federation. In addition, each member every payday contributes threepence to the district funds on account of services by an eye specialist, one shilling for a general fund, another shilling for the local lodge fund, and, if he is a contract worker, sixpence per pay for the services of the checkweighman. Apart from the problem of the heavy expenditures on strike-pay,[38] and of their equitable distribution, it is a constant cause of bewailing among Federation officials that many thousands of pounds have to be spent annually in legal and specialists' fees for the contesting of compensation cases of men injured at their work.

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[34] The annual subscription is spread over the year in 1s. or 1s. 6d. contributions per pay.

[35] Seldom less than 2½ per cent. of a man's pay. For the 1929 lock-out about 12½ per cent.

[36] E.g., 1¼ per cent. of earnings to support the British miners in 1926.

[37] The "Labour Daily," support of which is compulsory.

[38] Dubbed "victimised pay." For a number of years the Federation also raised levies for the sustenance of unemployed miners. Thus from 1915 to 1924 £250,000 was spent in the Northern District on unemployment sustenance. The increasing unemployment in recent years has forced the Federation to discontinue regular levies of this kind.

In so far as the Federation may be said to have any policy of reform in relation to the industry, it centres round the questions of the contract system and the system of arbitration. Opinion in the organisation, more particularly since the industry has entered the black period of heavily reduced working time from the end of 1927, has concentrated on the desirability of a guaranteed weekly wage, irrespective of piece earnings. As for arbitration machinery,[39] the Convention of June, 1928, definitely committed itself to the abolition of the existing Coal Tribunal in favour of "pit-top conciliation and direct action." It is questionable, however, how far such formal decisions really represent the mind of the mass of mine-workers. Militancy *by* the Federation has in recent years been less marked than militancy *within* the Federation. The tradition of militant aggressiveness developed most intensively during and for a few years following the harsh period of falling earnings between 1901 and 1906, and was revived during the time of much intermittent employment between 1914 and 1918. The present period has produced another resurgence of militant propaganda, the special feature of which, however, is its direction by what is called the Miners' Militant Minority Movement against the "two oligarchies"[40] of the Central Executive and the Northern Management Committee of the Federation itself. In addition to the domestic aim of reorganising the Federation "on the basis of rank and file control through the medium of mass meetings constitutionally held every six weeks," the Minority Movement proposes for the industry in general (*a*) the establishment of a six-hour day and a five-day week, (*b*) a national minimum weekly wage of £5 10s., (*c*) abolition of the contract system, (*d*) abolition of the Coal Tribunal, (*e*) abolition of district agreements and the establishment of a national agreement, and (*f*) the socialisation of industry.[41] The influence of this Minority Movement has shown itself in the resolution on arbitration at the 1928 Convention, and in the "mass" picketing operations during the lock-out of 1929, but it is probable that the great mass of miners regard most of the objectives of its programme as hopelessly beyond practicability in the existing trend of the industry, and are not excited to enthusiasm by such millennial hopes.

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[39] Discussed in Chapter VIII.

[40] See letter by a Minority Movement member in "Labour Daily," 6th April, 1928.

A final word must be said of the external relations of the Miners' Federation with other labour bodies. Outside Australia it is linked by affiliation with the United Mine Workers of New Zealand and the International Miners' Federation, the headquarters of which are at Brussels, relations which at least keep the executive officials in Australia notified of developments affecting mine-workers in other parts of the world. In Australia the Federation is affiliated with and represented directly on the Australasian Council of Trade Unions, with its headquarters in Melbourne, although the miners' body is not connected organically with the Trades and Labour Council of New South Wales, which is an administrative branch of the A.C.T.U. The coal miners of New South Wales have long withdrawn organic connection with the unions dominating industrial politics in the Sydney Trades Hall, and have always insisted upon the maximum of self-direction. Indeed, it is probably no exaggeration to say that an identical motive underlies their acceptance and the Australian Workers' Union's rejection of the scheme of the One Big Union[42]—the big organisation's anxiety to maintain its powers and prestige in its relations with the lesser sort.

III. THE STATE AS COAL ENTREPRENEUR.

The regulative hand of the State has been laid at more than one point upon the affairs of the coal industry in

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[41] "Labour Daily," 24th March, 1928.

[42] The largest union in Australia, comprising about 150,000 members, mainly in rural and constructional work occupations.

Australia. From the granting of the necessary Crown leases before coal-winning can start, the safeguarding of the rights of investors under the Companies Acts and of the mine-workers under the Mines Regulation Acts, the setting up of arbitration machinery for the maintenance of wage standards under the Comomnwealth Industrial Peace Act, the charging for services rendered by State instrumentalities such as railways, cranes, harbourage and wharves, the compelling of contributions to Workers' Compensation and Family Endowment funds, to the taxation of business incomes by Federal and State Departments, public authority has placed numerous external restraints upon the free activities of private enterprise. More Royal Commissions of enquiry have probed into the business of coal than into any other private industry. During the war, as in other countries, the needs of the time obliged the National Government to appropriate control to itself, more especially in the dual fixation of wage rates and coal prices.

Some forms of this regulative procedure by public authority are, of course, not peculiar to the sphere of coal. But the fact of the abnormal extent of such "interference" in this industry is at least evidence that the ordinary controls of free competition have not produced that smoothness of operation which would properly relegate the State to its function merely of the watchful "industrial policeman." There is much difference of opinion in the Commonwealth as to whether the piecemeal intrusion of the State into the affairs of coal has really gone far to eliminate the confusion into which the industry has again and again relapsed. Most of the criticism of "Government interference" has been centred upon the various experiments in compulsory wage arbitration. Such criticism is all of a piece with the discontent felt with compulsory arbitration in general in Australia. For the most part, however, it forgets that the State would probably not have expanded its magisterial functions in this direction had unfettered free enterprise been able to settle its own problems of industrial dissidence.

The State has taken a step farther than regulation. It has entered the field of coal operations in competition with the private owner. The extent of such government enterprise in black coal production, it is true, is as yet not very great; but in brown coal production, as already indicated, it is the only undertaking of account. The total output of black coal from State mines in Australia was about 9 per cent. of the national production in 1927. The State mines of Wonthaggi, Victoria, accounted for 610,618 tons,[43] or for more than half this total, and the Yallourn "open cuts" for not far short of 1,500,000 tons,[44] or practically the whole of the State's output of lignite. New South Wales and Queensland States are also colliery owners, the former's mine at Lithgow producing in the same year 361,814 tons and the latter's four mines at Bowen (93,492 tons), Rockhampton (39,616 tons), Mount Mulligan (20,063 tons), and Mount Morgan (16,975 tons) respectively, a total of 170,146 tons. In the early history of the Collie field, Western Australia, the State operated a mine, but soon leased it to a private company, and has not since reassumed control. Of the coal-producing States Tasmania alone has not tried the experiment of government ownership.[45]

What have been the main motives prompting the State to enter the productive field? That they have not arisen solely from the influence of nationalisation as a social and economic doctrine is deducible from the fact that the two big State schemes in Victoria were inaugurated by anti-socialist Governments, and are the pride of present-day Nationalist and Labour Ministries alike. Moreover, although the Labour Governments of Queensland and New South Wales were primarily responsible for the enabling legislation in those States, there has been no serious threat to the existence of the State mines by their political opponents. The simple first explanation is that the State has found it good business to have direct control of at least some portion of the supplies upon which its major public utility undertaking—the railways—depends. That is a prime consideration in New South Wales, Queensland and Victoria. Indeed, in New South Wales the State Coal Mines Act of 1912, which, *inter alia*, empowers the Government to open and work coal mines, specifically limits the disposal of the output to State departments or undertakings. About 17 per cent. of the coal required for Departmental purposes is drawn from the State mine. In Victoria and Queensland, however, the State collieries may and do enter the competitive field of private enterprise, as does the Victorian State Electricity Commission in the sale of electrical energy and briquettes.

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[43] For the calendar year 1927.

[44] 1,453,614 tons for the calendar year 1927. During 1928 the output was not far short of 2,000,000 tons.

[45] It is perhaps relevant to remark that in New Zealand two State mines between them produced 175,117 tons in 1927 for use by the railways and Government departments and for sale to shipping companies, gas companies and other industrial consumers.

Direct exploitation of coal resources by the State has also perhaps, in different degrees in Victoria, Queensland and Western Australia, been bound up with the desire to be economically independent from New South Wales. This independence is being assured in the Western State, where the existing private enterprises are able to supply the Government Railways and Electricity Supply on such satisfactory terms that any strong urge to the resumption of State coal exploitation is wanting.[46] In Queensland the Government mines contribute their mite of 15 per cent. of the State production to the cause of emancipation.

It is in Victoria, however, that the motive of self-dependence has most strongly impelled the State into coal production. The State coal mine at Wonthaggi was opened in 1909 as an emergency measure to provide the Victorian railways with coal during the great Newcastle strike of that year. The paralysis of Victorian industries during that historical episode created fears verging almost on panic. The Government of the day acted promptly in the crisis, and in an amazingly quick time, with the aid of a small army of men, had concentrated on its own shaft sinking and, eventually, coal winning on the Powlett coal field, to which railway facilities were hastily constructed. Thus began an enterprise which continued so to expand that, whereas the Victorian Railways in 1907-1908 were drawing only 11 per cent. of their coal requirements from Victorian sources, by 1927-1928 the proportion (all from the State mine) had grown to 70 per cent.[47]

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[46] The Government Railways and Electricity Supply absorb about 74 per cent. of the output of the Collie mines.

The entry of the State in Victoria into the field of electrical power generating based on the exploitation of brown coal was not so dramatic, but was the response to at least a serious and urgent situation. In 1917 it was realised that the growing electrical needs of consumers within the State were fast overtaking the capacity of municipal authorities and private companies to produce the supply. The report of an Advisory Committee on Brown Coal appointed by the Government early in that year led to the introduction and adoption of an "Electricity Commissioners Bill" in the next year and the passing of an Act late in 1919 authorising the first expenditure upon the Yallourn scheme, as propounded by the newly-appointed Commissioners.[48] It is significant for our purpose here that, apart from the necessity of meeting immediately on a State-wide scale the rapidly increasing demand for electricity for industrial, traction and household purposes, and from the probability of cheap generating costs if brown coal were used, a factor of great persuasiveness in the Government's decision was the possibility of rendering Victoria "independent of imported fuel" and "immune from interruptions following industrial troubles in other States.[49] How far this possibility has been realised will be among the matters within the scope of the next chapter to discuss.

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Year.	N.S.W. tons.	Victorian. tons.	Victorian percentage.
1907-08	295,033	38,397	11
1927-28	204,602	493,389	70

[48] The State was fortunate in securing as Chairman Lieut.-General Sir John Monash, G.C.M.G., K.C.B., V.D., D.Eng.

[49] "Yallourn and the Associated State Electricity Schemes of Victoria," published by the Commission.

CHAPTER V.

THE DEMAND FOR COAL IN AUSTRALIA.

I. The Uses for Which Coal is Sold.

To force a yield of coals from the "deep delved earth" beyond the measure of real needs is a waste of labour and ingenuity; to build organisation for the disposal of such excess is not even a work of supererogation. It is because the volume of demand for coal is neither so fixed as to discourage the individual producer from hopes of further business, nor so variable as to satisfy the normal aggregate of such hopes in the industry, that over-production and over-organisation frustrate initiative. Every industry knows something of the exacting problem of adjustment between productive capacity and consumers' demand. Analysis will show that a perpetual tendency to maladjustment in the coal industry in Australia is a prime source of its distresses. The full significance of this problem will be discussed later, but it is first necessary to consider what actually constitutes the demand which fixes the limits of productive performance. What, in other words, is the scope of the market for Australian coal both within and outside the Commonwealth?

The market for much the greater part of Australian coal is Australia itself. For the period of seven years ending with 1927 an average of 84 per cent of the national production of black coal was sold for use within the national boundaries. In what direction and to what uses did this coal flow to its points of consumption? Unfortunately for a complete answer to these questions, industrial statistics in Australia are not adequate. Movements neither of Interstate trade generally nor of fuel materials to particular industries[1] within the several States are recorded by the Commonwealth Bureau of Statistics. As for coal statistics generally, the best, as might be expected, are collected in New South Wales by the several Government Departments interested, but in the absence of comparable records in other States, the investigator of the facts for the whole Commonwealth is left largely to circumstantial calculation. Not the least of the aids necessary for the guidance of the Australian coal industry past the shoals which will continue to threaten its future is an agency, comparable to the United States Bureau of Mines, with powers to collect and interpret economic data.

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[1] Such as those published for N.S.W. in the "N.S.W. Year Book, 1927-1928," pp. 343 and 388.

Sales of coal are capable of both a geographical and a utility classification. We may, for instance, enquire into the extent of local sales of native coals within each State, of sales outside the State borders, and of bunker sales of Australian coal generally within Australian ports.[2] A utility classification of sales will, on the other hand, first distinguish broadly between the industrial and the household demand for coal, and, secondly, be concerned with the relative importance for coal of its various industrial uses.

In every State except New South Wales the coal produced is almost entirely for use within the State boundaries. Victoria and Tasmania at present have no Interstate or overseas sales of coal whatsoever, Queensland a sale of bunkers in Brisbane equal to about 9 per cent.[3] of the State production, and Western Australia a small sale of bunkers in Fremantle. Indeed, with the exception of Western Australia, all of these States, as well as South Australia, still lean heavily on New South Wales coal supplies. The Mother State between 1913 and 1927 has consumed annually on the average 54 per cent.[4] of the product of her own collieries, the range of variation in particular years being from 40 to 62 per cent. Of the average of 46 per cent. sent outside the State, about two-fifths have been absorbed by other Australian States, a

[2] This would include sales of bunker coal to overseas as well as interstate and coastal vessels. Ordinarily overseas bunkers are associated in statistics with overseas coal cargoes and will therefore receive consideration also in Chapter VI.

[3] 98,640 tons for the year 1926-27.

[4] 5,965,000 tons.

fact emphasising the importance to New South Wales of the portion of the non-locally consumed surplus shipped to other than Australian ports. Only the Northern and Southern fields engage in an export and bunker trade, and the business of the latter is only about one-fifteenth that of the former. For the seven years ending 30th June, 1928, sales of bunker coal for Commonwealth ports outside New South Wales were about 30 per cent. of the total bunker sales made. As bunker coal has over the same period represented about one-quarter of the total surplus coal sold from New South Wales, any diminution in its flow, either Interstate or overseas, is of serious concern to the coal producers of that State.

The fact that coal is sold for a wide variety of industrial uses, as well as for purposes of the home, ensures a stability for its total sales not always available to the products of specialised manufacture. It is questionable whether the coal producer has fully appreciated this advantage which he has over fellow-industrialists. Coal for domestic purposes does not figure very importantly in Australia; at any rate, not in comparison with the totals sold to industries, nor in comparable sales experience with that of other countries where cold weather conditions emphasise the importance of the domestic fireplace.[5] The proportion of total sales for various industrial uses throughout the continent are among the data for which available statistics are not satisfactory. It is certain, however, that railways represent the largest single consumer among industrial categories. This is true of every State, as well as of the Commonwealth as a whole. The New South Wales railway locomotives alone, which consume directly twice as much black coal as the Victorian, absorb annually nearly 20 per cent. of the State's coal consumption.[6]

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[5] Yet even in Australia the seasonal variations of domestic demand for gas and electric power, both for lighting and heating, are an important consideration for gas works and power-production undertakings, as are similar variations for the sales of briquettes and household coal in Victoria and of household coal in all States. The tonnage of coal used directly in 1927 by domestic consumers in N.S.W. (for which State alone a calculation has been possible) was 500,000, or 7 per cent. of the State's coal consumption.

[6] I.e., 1,342,000 tons for year ending June, 1927, as against State consumption for 1927 of 6,786,900 tons.

Next in order of demand for black coal, as well as being the main consumer in Victoria for brown, are the electric light and power plants of the country. This remains true for the Commonwealth as a whole, even although for New South Wales, Victoria and Tasmania it is not so. Victoria and Tasmania are in a position to forgo the use of the costly black fuel because of the former's combined brown coal and water-power resources and the latter's large hydro-electric scheme. In New South Wales, on the other hand, considerable as is the quantity of coal used in electric light and power works,[7] almost twice as much is consumed by engineering, iron and steel works, with associated coke plants.[8] Iron and steel manufacturing plants exist only in New South Wales, the source of the necessary metallurgical coals.

Gas-works appear to take the next place in importance among the industrial consumers. In 1925, the latest year for which the figures were conveniently available, the 106 gas-works in Australian cities and towns absorbed 10 per cent. of the national consumption of coal.[9] In 1927 the proportion represented in the New South Wales total was a little over 9 per cent.[10] Following these may be taken two groups of categories of about equal importance: those industrial plants requiring much heat for the working of heavy raw materials, as in the making of bricks, tiles, pipes, glass, lime and cement; and those engaged in general manufacture, including the preparation of foods and drinks, sugar refineries and mills, ice and refrigeration works, and flour mills. In New South Wales the coal fuel requirements of these two groups absorb about 7 and 8 per cent. respectively of the total coal consumption.

From the above analysis it is seen, then, that the coal industry depends upon the household consumer to absorb

[7] 860,000 tons in 1927, or 12 per cent. of the total consumed within the State. This tonnage includes coal for electricity for railway purposes.

[8] 1,600,000 tons in 1927, or 23 per cent. of the State consumption. The coke plants alone required 1,060,000 tons.

[9] An estimate, based on figures supplied by Mr. R. Andrews, B.Sc., research chemist of the Metropolitan Gas Company, Melbourne, on the assumption that each works obtained 14,000 cubic feet per ton of coal. The total estimated coal consumption for gas during 1925 was 1,259,865 tons; the total national consumption for all purposes, 12,536,000 tons.

[10] 620,000 out of 6,786,900 tons.

one-fourteenth of the coal which it disposes upon the Australian market. The household market for coal in Australia is one that will always be circumscribed by the dictates of the temperate climate enjoyed by the mass of Australian town dwellers. Chief among industrial consumers are the railways. Do they represent a market for coal capable of much expansion, or one capable of offering as much encouragement to the coal vendor as the power generating plants, the heavy iron and steel industries, the gas-works, and the factory undertakings of the country? What has been happening to the demand in these particular markets over recent years will throw at least some light upon this important question.

II. WHAT IS HAPPENING TO THE DEMAND.

The *coal-consuming capacity* of all these industries must, it is obvious, tend to increase with the industrial growth of the country. But it is not so obvious that such increase must be in the measure of the growth of the industries themselves.

Unfortunately, entirely satisfactory means of measuring the quantitative growth of these industries are not available. But there is at least indirect evidence of the disparity between the growth of the total coal consumption and growth of total power consumption in respect of the actual horse-power "in use"[11] in factories. Between 1915 and 1925 the total tonnage in black coal consumed in Australia increased from 9,250,000 to 12,536,000, or by 35½ per cent.; in the same period the recorded actual horse-power of engines installed for use in factories increased from 504,834 to 1,260,076, or by 150 per cent. The power in engines driven by steam, it is true, rose from 333,494 to 715,475, or by 114 per cent., but no negligible part of this power would be derived from the burning of wood, gas and oil. Horse-power in engines with oil as the prime mover grew from 8,558 to 17,232, or by 101½ per cent., and in those with electricity as prime mover from 107,788 to 394,381, or by no less than 265 per cent. The significant thing in these figures is the growing use of oil and electrical power. While, of course, the bulk of the electrical power is derived from the burning of black coal, not less than 27 per cent. of the total electrical power in Australia is drawn from the brown coal and hydro-electric resources of Victoria, which have thereby become a potent rival of black coal in that State.

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[11] The unsatisfactory feature of this measure lies, of course, in the ambiguous meaning of "horse-power of engines used." In the first place, the installation of engines of greater horse-power does not represent an equivalent increase of power consumption; in the second place, not every installed engine of a given horse-power is in full and continuous use.

There is thus evidence that the consumption of all forms of motive power in Australia is growing faster than the consumption of black coal alone. Whether the consumption of coal itself has been advancing or falling back relatively to the growth of industrial production generally there is neither adequate nor reliable enough statistical evidence to demonstrate. But the absolute growth of black tonnage consumed, from 7,420,000 tons in 1911 to 12,360,000 tons in 1926,[12] has hidden rather than revealed the tendency in the Commonwealth, as elsewhere, to a *relative* contraction in the demand for industrial coal as such.

What alteration in the conditions of the market have produced this contraction? Closer examination, in terms of our geographical and utility classifications, of the changes in coal sales over a period of years should reveal their connection with the lagging demand.

Between 1913 and 1927 there was an irregular increase of consumption, but in unequal degree, within each State of its own native coals. This increase was most marked in Western Australia, Victoria and New South Wales. In the two latter States the tonnage percentage of such increased consumption was nearly 37 and 38 respectively. The period of the war years is of special interest in this regard, inasmuch that, while the total coal output of Australia and of New South Wales in particular *fell*[13] heavily from the 1913 level, the con-

[12] The last date for which the figure is available.

[13] By as much as 2,287,000 tons in N.S.W. in 1915.

sumption of coal within New South Wales *did not cease to increase*[14] at a time when other States and New Zealand were forced to go on short commons. It has been fortunate for the New South Wales coal producers that their own State has been capable of consuming more coal each year from as far back as 1906 up to 1927 with almost regular consistency,[15] 1927 itself being the year of maximum consumption. The significance of the less regular but definite trend to increase of native coal consumption in other States lies in its effect upon the sales of the "export" surplus of New South Wales.

It is clear, of course, that variations in the volume of these sales will have been associated with variations in the stability of the coal-consuming industries in the States concerned. Coal sales, in other words, are a function of the phases of the ordinary industrial or business cycle. Thus it was inevitable that the years of great *general* business activity in Australia, namely, 1913, 1920-21,[16] and 1924-25, should mark abnormal increases in the sales of New South Wales coals in other States. These peak points, however, were inevitably followed by recessions. Thus undoubtedly the industrial depression which began to settle over Australia in 1925 accounts in part for the subsequent falling off in the sales of coal exported Interstate from New South Wales, as shown in the following Table:—

TABLE IX.

COAL EXPORTED INTERSTATE FROM NEWCASTLE

(Cargo and Bunker)—Unit = 1000 Tons.

To	1921	1922	1923	1924	1925	1926	1927	1928
Victoria	1486	1539	1384	1691	1501	1389	1271	1129
South Australia ..	789	826	621	904	935	887	969	711
Queensland ..	96	93	72	78	101	104	48	71
Western Australia	184	110	67	82	115	77	76	89
Tasmania	89	113	121	154	125	116	115	109
Total ..	2644	2681	2265	2909	2777	2573	2479	2109

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[14] By as much as 1,459,000 tons in 1918.

[15] Stepping up from 2,664,822 tons in 1906 to 6,786,906 tons in 1927. In only six of the twenty-two years was there a stepping downward, the most serious drop being 513,000 tons between 1918 and 1919, as against an average of 420,000 tons in the increases. As the estimated drop in the State production of 1,750,000 tons for the black year, 1928, was mainly on account of lack of orders for sales outside the State, the N.S.W. market may be regarded as still relatively buoyant.

[16] Extending also for some coal-consuming industries into part of 1922, with a consequent inflating of interstate coal sales for that year.

But cyclical variations tend to hide and not explain the causes of a noticeable drift towards shrinkage of the purchases of New South Wales coals by the rest of Australia, more particularly by the coal-producing States. Eliminating the influence of the peak years of general business and manufacturing activity, 1924 and 1925, the general trend of sales is seen to be downward, especially in Victoria, where they matter most, and in Western Australia and Queensland. It is, of course, the Northern coal fields of New South Wales which are feeling the pinch of this decline. It was the swift declension of their "export" coal business by about 12½ per cent. for the twelve months ending in June, 1928, with still greater decline in the rest of the year, that precipitated a condition of acute crises on those fields.

Turning now to our industrial utility classification of sales, some interesting changes in the demand for coal are observable. Again recourse must be had to a piecing together of the available data. With regard to the chief industrial consumer of coal, the railways, the noticeable feature is the relatively slight tonnage variations in their demand over a period of years. In Victoria, where the Government Railways have on the average purchased annually 633,000 tons of coal between 1913 and 1928, the smallest tonnage acquired in any year has been 525,000, the largest 781,000, or a variation of 128,000 tons from the average. In the New South Wales system, with a consumption more than twice the Victorian, the variation from the average between the years 1923 and 1927 has been still less, namely, 122,000 tons. A comparable stability may be assumed for the other States and for the Commonwealth Railways. As the railways of the country are responsible for between one-quarter and one-third of the total national consumption of coal, it will be seen that they represent a major influence in rendering the demand for coal in Australia relatively inelastic. Such variations as the railways do make in the demand for coal move with changes in the volume of traffic which they are called on to carry; in other words, with the changes in general business activity.[17] It is obvious that no favours in price from coal vendors to railway managements can have any considerable effect in increasing sales of coal along this channel of demand.[18]

Demand for coal is much more variable with the next two most important customers among the industrial categories, namely, the metallurgical and engineering industries on the one hand and electric light and power works on the other. In terms of the "value of fuel and light used in factories" the former group occupies first place and the latter second in the schedule of industries in the Commonwealth.[19] As, also, nearly one and three-quarter times as much money is expended for "fuel and light" on the metal and engineering works of New South Wales as for all the rest in Australia, the variations in their demand for coal have the greatest significance in that State. Examination of the tonnage consumption figures for New South Wales from 1921 to 1928 shows a tendency to regular and substantial increases in the demand each year, broken, however, by serious slumps in 1922 and 1928, when the large steel works of the Broken Hill Pty. Coy. at Newcastle found extreme difficulty in the disposal of their products at an economic price.[20] In iron and steel production coal is a major element in the cost;[21] so much so that, if the price paid for it be kept rigid at a high level, no amount of economising in other costs will at times prevent the cessation of operations. The metal production and engineering industries are competitive in a degree in which State railways obviously are not. As, in fact, in New South Wales they normally, for all their needs, consume *more* than the railways, and can step up their purchases by larger annual tonnages, it is clear that the demand which they offer to the coal industry is capable of greater elasticity. The price of coal is here, in other words, a more important function of its sale. None the less, of course, the outer limit of the expansion of sale is set by the capacity of the metal products industries to engross business on the Australian market and to dispose of portion of their output abroad.[22]

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[17] This may be illustrated from the Victorian Railways, whose purchases showed an increase in 1920-21 and 1924-25, years of boom in business, and a decrease in 1915-16, 1918-19, 1922-23, 1925-26, and 1927-28, years more or less of business recession.

[18] Even though the annual average increase in mileage opened (since 1916) is 534 miles. "Commonwealth Year Book," 1927, p. 283. A sufficient drop in price might, however, diminish the need for developing inferior coal deposits, diminish the intrusion of imported coal from abroad, and stay any experiments in the use of oil as a fuel on the railways.

[19] Viz., £3,585,728 and £3,133,143 respectively out of a total of £13,083,226 (excluding railways, shipping and mining) for all industries in 1925-26.—"Commonwealth Year Book," 1927, p. 792.

[20] The works were closed entirely for most of 1922, and operations involving the work of nearly 1,000 men curtailed in September, 1927.

[21] At the B.H.P. Steelworks some 17,500 tons of coal, of which 11,000 tons is used in the making of coke, are consumed weekly.

Electric light and power works, apart from their high place for absolute coal consumption in the category of industrial purchasers, have shown a capacity for annual demand increases relatively more consistent than that of any other industrial group; although, as will be shown in the next section, this has involved economies in black coal consumption contributory to the general embarrassment of the black coal industry. Between 1921-22 and 1925-26 the production of electric light and power in Australia increased by more than 115 per cent.[23] New South Wales again occupies the foremost position among fuel consumers in this connection, the value of the coal so used in that State being more than half that for the whole Commonwealth,[24] and more than twice that for Victoria.[25] In the Mother State the tonnages of black coal consumption in electrical generating works have been stepped up fairly consistently by an average of 43,000 tons annually from 524,167 in 1921-22 to 856,997 in 1926-27.

These facts suggest the possibility of an elasticity in the demand for black coal in power production. The upward movements both of coal prices and coal consumption in recent years appear to counter this influence. But that raw fuel prices in the production of electricity *can* influence changes in the quantity demanded for use has already been shown in our section dealing with the economics of brown coal winning.[26] In Victoria the volume of brown coal absorbed by the State Electricity Commission has grown annually from 116,888 tons in 1923, when coal-cutting operations began for power-house purposes, to 1,455,482 tons by the middle of 1928, and has already reached the 2,000,000 mark for a twelve months' period. The conclusion appears unavoidable that the dependence of a multiplicity of power-producing authorities in the Commonwealth upon black coal from suppliers capable of maintaining a monopoly-controlled price has robbed the demand for coal in this part of the consumption field of much of the desirable elasticity of which it is capable.[27] Black coal for electricity production in Australia *could*, in other words, be used much more extensively in the absence of the artificial conditions which inflate its price.

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[22] As is being done at least in the agricultural implement industry.

[23] From 801,650,705 to 1,729,936,637 British units.—"Commonwealth Year Book," 1927, p. 824.

[24] Viz., £1,410,961 out of £2,684,312 in 1925-26.—"Commonwealth Year Book," Ibid.

[25] Viz., N.S.W. £1,410,961, Victoria £650,222, in 1925-26. Incidentally, this indicates a greater economy in Victoria in the use of fuel for light and power purposes; for with less than half such fuel costs, the value added in the process of manufactures in Victoria is at least two-thirds that of those in N.S.W.—"Commonwealth Year Book," 1927, p. 796.

The production of gas for domestic and industrial purposes in Australia has not, contrary to expectations based on the expansion of the electrical-power industry, shown any tendency to contraction. This experience is parallel to that of the United Kingdom, the United States, and other industrial countries. Between 1919 and 1925[28] the annual tonnage consumed by commercial gas and coke works in Australia grew from 905,000 to 1,260,000, an increase of 39 per cent. Does this growth suggest that gas and coke production offers a favourable field of expansion for coal-selling in Australia? It is very doubtful whether much promise lies in this direction. Although the cost of coal constitutes about 25 per cent. of the retail price of gas, from which it might be deduced that there is ample room with coal price reduction for price improvement to the gas consumer, the tide is already sufficiently too strong in favour of electricity as against gas, with both domestic and industrial consumer, to enable the demand for gas to recover all its lost elasticity.

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[26] Chapter III., Section III.

[27] The cost of coal constitutes about 15 per cent. of the retail price of electricity.

[28] The last year for which the figures upon which the estimate is made are available for Australia. See footnote references to gas-production in Section I. of this Chapter.

Finally, with regard to the miscellaneous manufacturing activities covered by the last two groups in our utility classification, the increase in coal consumption over recent years appears to be much less noteworthy than in the industrial fields already discussed. True, there has been increase in the capacity of manufacturing plants to consume coal directly as the source of their power, but not (as already pointed out) an increase proportionate to the growth of horse-power in machinery installed. Again to use New South Wales as the index State, whereas between 1921-22 and 1926-27 the coal consumption of the group of industries requiring considerable heat in the making of bricks, cement, lime, glass, tiles, pipes, etc., grew with regularity by about 25 per cent., the coal consumption of those engaged in the making of food and miscellaneous products appears to have remained almost at a standstill. Taken altogether, the progress of coal consumption in most of the manufacturing industries in New South Wales over the period has not been above between 6 and 7 per cent. If other States could be embraced in the count, it is probable that a stepping short in the march of *direct* coal fuel consumption in the aggregate of such manufactures in Australia would be discernible. Why this should be will be left to the next section of this Chapter to try to explain.

III. The Struggle Against Substitutes.

One aspect of the modern "bother about coal" which intrigues the public interest is the disturbing invasion of substitutes. The embarrassments of this encroachment are as little welcomed by coal producers in Australia as they are elsewhere. For the competition it has brought has been an insinuating thing, slow in the accumulating of its strength, and as difficult to locate as it has been to kill. That at least tends to be the view of the coal producer, more especially in New South Wales. For to those engaged in coal getting in the major coal-producing State of the Commonwealth the problem of fuel substitutes on the Australian market is hydra-headed. Or, to mix one's metaphors, warfare against the forces which tend to contract the market in Australia for the New South Wales coal producer must be waged on at least four different fronts.

There is first the steady expansion of competing black coals in other States. Secondly, there are the big strides in brown coal production in Victoria. In the third place, there is the steady economising in the use of black coal itself. And fourthly, there is the penetration of hydro-electricity and the alien broods of petroleum oils and spirits. These developments, separately and together, have been exercising no small influence, particularly since the war, in those changes in black coal sales within the Commonwealth which we have already discussed.

From the national standpoint it is perhaps gratuitous to place Australian black and brown coals worked outside the borders of New South Wales in a classification of "substitutes." None the less, from the standpoint of New South Wales, and more particularly from the viewpoint of the major coal fields of that State, these other coals are regarded as the enemy within the gate. That there may be some measure of justification for this attitude, even from the national standpoint, will be gathered from Chapter VII. Practically all of these coals are inferior to those of the Maitland and Newcastle fields. Yet they are succeeding in dislodging New South Wales coals from widening areas in the industrial markets of their respective States.

Thus, in Victoria, the output of local black coal has increased steadily from 476,823 tons in 1923 to 684,245 tons in 1927, and that of brown coal in the same period by a tremendous stride from 116,888 to 1,455,482 tons, or by an equivalence of upwards of 300,000 tons of Maitland coal. This use of indigenous resources in Victoria sufficiently indicates why New South Wales coal has not only not maintained its proportionate share of fuel power purveying in the growth of Victorian industrial production, but has suffered considerable displacement.

The extent to which the black coal of Victoria has contributed to this result is shown in the facts, first, that imports of New South Wales coal for the Government Railways were lower in 1926 and 1927 than they were in 1908,[29] and, secondly, that imports for private uses were virtually no different in 1927 from what they were in 1918,[30] and have, in the years between, been almost as frequently below as above the 1918 level.

As for brown coal, it has proved indirectly to be a displacer not only of black coal from New South Wales but of black coal from Victorian mines. For, in the first instance, the piecemeal electrification of Melbourne's tramway system is steadily reducing the annual tonnage of coke, made from Maitland (N.S.W.) coal, required for the cable traction lines,[31] and the complete electrification of the metropolitan railways has eliminated a field of consumption for Wonthaggi (Vic.) locomotive fuel, both metropolitan transport systems drawing their power requirements from the State Electricity Commission's supply. In the second place, the Electricity Commission's aggressive policy is bringing an increasing number of steam-driven industrial plants into the list of those employing electrical power as the prime mover. One noteworthy aspect of this trend is the transmission of electrical energy to rural centres. Thus, of the 61 butter factory installations within range of the Commission's main, 34 have already converted from wood, gas or oil fuel to an electric drive with power supplied by the Commission.[32] It is only a matter of a few years before the 141 drives in butter factories still outside the reach of the existing mains will have the choice of electric power. While, of course, very few rural dairy-products factories in Victoria at present find it economical to use coal as fuel, the significance of this trend to electricity lies in the contribution it makes to the economical use of brown coal for power generation and in the shutting out of a potential future market for black coal in rural centres at a time when the cost of burning wood will have become uneconomically high.[33]

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[29] 257,391 tons (1926), 253,704 tons (1927), as against 358,470 tons (1908). Figures of Victorian Ports and Harbours Department and Melbourne and Geelong Harbour Trusts.

[30] 958,534 tons (1918); 957,053 tons (1927).

[31] From 39,120 tons in 1923 to 25,820 tons in 1928. (Figures supplied by Chief Engineer, Melbourne and Metropolitan Tramways Board.)

[32] These figures were supplied by the Commission.

One further aspect of brown coal as a substitute for black in Victoria is the growing sales of briquettes. As nearly one-third of the brown coal output of Yallourn is converted into briquettes for the Victorian industrial and domestic market; and as the growing sales[34] show increasing popularity for this manufactured product, as well as its capacity to compete with wood fuel on the one hand and with both Victorian and New South Wales coals on the other, despite railway freight rate discrimination very much in favour of firewood and coal;[35] it is clear that the briquette promises to become no mean substitute and rival of black coal in at least one State of the Commonwealth.

The same self-emancipation from dependence on New South Wales coal, through the development where possible of their own resources, is evident in other States, especially Queensland and Western Australia. Whilst the 71 collieries operating in Queensland together do not produce a tonnage equal to that even of the Western District of New South Wales, they have been able over a period of years so to serve the fuel requirements of their State that it has not had need to import from its southern neighbour a tonnage reaching 10 per cent. of its own

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[33] It is relevant here to state that of the 122 butter and bacon factories in N.S.W. three of the largest have transferred from coal to electricity and six others to crude oil. Most of the dairy-products factories in N.S.W. are located close to or amidst timbered country, and are consequently fuelled by wood.

[34] Sales since the opening of the factory in 1925 have been:

1925	73,597 tons
1926	85,781 ,,
1927	104,165 ,,
1928 (year ending June)	121,738 ,,

The average output per day in 1927-28 was 400 tons. Before the end of 1930 the expected daily output will be 1200 tons.

[35] The Railway Department charges the Electricity Commission the higher rates for firewood carriage, to the advantage of both Wonthaggi and N.S.W. coals.

output. Queensland, indeed, aspires to be an exporter rather than an importer of coal. Whilst the production of the Western Australian mines is less than half that of the Queensland, and has suffered considerable fluctuation for its size during the past ten years, it is tending in the direction of growth and the ousting of the New South Wales product from the West. Seventy per cent. of the output is absorbed by the Western Australian Railways and Tramways and Electricity Supply, and these authorities between them, while taking increasing quantities of the local fuel, ranging up to 260,000 tons annually, have not for a decade, as before stated, purchased more than 11,000 tons of coal from the East. The freight charges of a long sea voyage, a prejudice engendered against New South Wales coal because of its price and liability to uncertain delivery in times of strike, and a strong local pride in all products of the West, have combined to loosen whatever hold the New South Wales producers may have hoped to retain upon Western Australia.

Tasmania is also trying valiantly, with an increasing annual output of indigenous coal, to gain greater independence of New South Wales, and is at least not increasing the quantity which she must get from that State for gas-making, coke manufacture and some steam-raising. The importation even of small quantities of Welsh anthracite for carbide manufacture has been a recent feature. Tasmanian coal-producers, like those of Queensland, cherish hopes even of an export trade, at least to the mainland States of Victoria and South Australia. South Australia, with no commercial coal of her own, has in the past, more than any other State, felt keenly her economic tutelage to New South Wales coal vendors, and it was with almost a whoop of triumph that her Premier[36] in 1928 was able to threaten the immediate importation of cheaper British coal for Government needs. Indeed, for some years it has been customary for some South Australian coal-consuming authorities to import small lots of coal from England when industrial troubles have stopped supplies from New South Wales.[37] It was the menace of coal orders going abroad for anything up to 800,000 tons for South Australian requirements in 1929 that, more than any other single threat to the industry of New South Wales, gave impetus to the action already taken in 1928 by the Premier[38] of the latter State to bring down the price of coal by 5s. a ton.

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[36] Hon. R. L. Butler.

Economies in the use of black coal itself as a contribution to the contraction of demand may, at first thought, seem insufficiently important to reckon among the bigger forces which we are considering. But, even if not of the greatest moment in the present stage of the development of industrial technique in Australia, they are bound to be of high significance if the Australian national ideal of a widely diversified and efficient industrial life is to be realised.

It may be held to be axiomatic that one objective to which engineering ingenuity is being constantly applied is the increased availability of energy from the consumption of a given quantum of raw fuel. Improvements in boiler, engine and machine design are nearly all some partial realisation of this purpose. The economist sees in this preoccupation of the engineer one aspect of man's unremitting fight to defeat the law of diminishing returns. This struggle goes on continuously. A more effective use of a ton of coal for any industrial purpose is just an increment of victory in the never-ending campaign.

Gains through technical improvements in the better utilisation of coal are doubtless being won in many a corner of the Australian industrial field, partly as a result of local inventiveness, but more probably through the ordinary course of "scrapping" old-model machinery for new and less effective processes for what are demonstrably better. The net effect of all this economising on the demand for coal is beyond measurement, but effect

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[37] E.g., the Adelaide Municipal Tramways Trust, which has annually, from 1924 to 1928, used coal from the Bothal Pits, England, in quantities varying from under 5 up to 3,176 tons.

[38] Hon. T. R. Bavin.

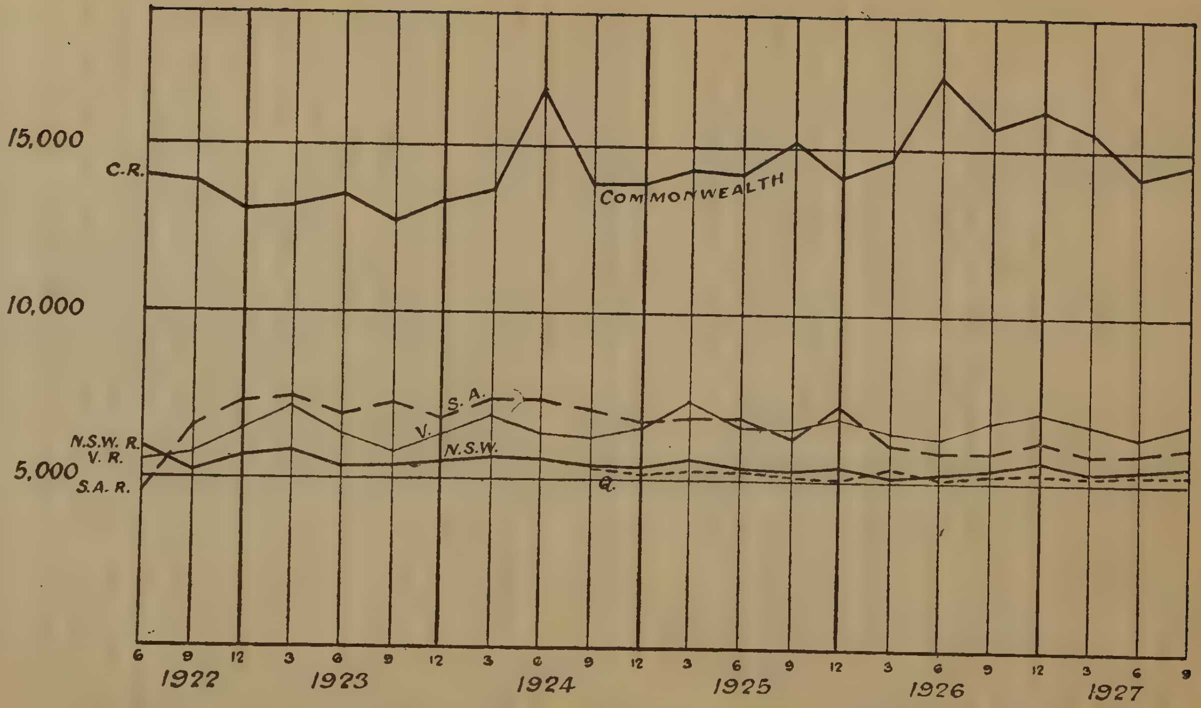

Figure IV.—Ton-Miles per Ton of Coal used, Australian Mainland Railways, 1922-1927.

there must doubtless be. Only over some one more or less large area of coal consumption for a single industrial process might it be possible to measure results.

Thus in the United States railways, as the result of improvements in the design and firing of locomotives, it has been possible between 1917 and 1925 to save no less than 36 lbs. per 1000 gross ton miles and 3.3 lbs. per passenger train car-mile recorded.[39] This is virtually equivalent to carrying the same volume of goods traffic in 1925 with 20 per cent. less coal than was required in 1917, and to running the same number of passenger cars the same number of miles with 17 per cent. less coal in the latter than in the former year. Likewise, although the output of electricity in the United States in 1924 was larger than in 1923, six million fewer tons of coal were required to produce it.[40]

Can comparable economies in coal consumption be detected in the fields of railway transport and electricity production in Australia? As for Australian railways, it is to be feared that coal saving in the driving of locomotives is not yet the advanced art which it has become in America. The accompanying graph (Figure IV.) shows the comparative performance in ton miles per ton of coal used in the several railway systems of the country between June, 1922, and December, 1927. The graph indicates that over this period there has been no noticeable improvement except in the railways operated by the Commonwealth Government. The Queensland and New South Wales systems appear to show the least economical results. The disparity between the results in these two State systems, on the one hand, and that of the Commonwealth on the other, is probably due in the main to the heavier country over which all the goods business of the former is carried. In New South Wales, moreover, there has in recent years been a large increase in the number of heavy type passenger engines not used to full load capacity. The average goods load capacity in that State is about 400 tons, whereas in the United States it is about 596 tons for freight plus, say, 50 per cent. for tare, making a total of about 900 tons behind the tender. This means that whereas the average locomotive in New South Wales burns 280 lbs. of coal, the American locomotive need only burn between 140 and 175 lbs. Other reasons, such as the many difficulties which have only just been overcome in the superheating of engines, or such as the temperament of the Australian locomotive fireman,[41] have been advanced in explanation of the poorer Australian performance. But whatever the explanation, the fact remains that there seems the likelihood for some years to come that little contraction in the demand for coal by the railways in Australia will be caused by better utilisation of the coal consumed.[42]

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[39] Dropping from 176 lbs. per 1,000 gross ton miles (including loco and tender) in 1917 to 140 lbs. in 1925, and from 19.4 lbs. per passenger train car-mile in 1917 to 16.1 lbs. in 1925. (Figures of the Fuel Conservation Section of the U.S. Railroad Administration, quoted in U.S. Bureau of Mines' "Coal in 1925.") A record of 131 lbs. per gross ton mile was achieved in the first half of 1928.

[40] Hamilton and Wright: "The Case of Bituminous Coal," pp. 182-183.

In electricity production in New South Wales the average number of units of power per ton of coal used increased from 626 in 1913 to 932 in 1926-27, whilst the number of cubic feet of gas per ton of coal increased from about 13,600 in 1913 to 16,500 in 1926-27. Evidence is also available of the economies to be gained by transforming the energy of coal into electrical power instead of losing much of it through wasteful processes associated with the furnace. While, of course, it is possible to secure just as much energy from coal burnt under a boiler in order to produce steam pressure for work in the immediate vicinity as it is to produce electrical current for work at a distance, there are undoubted gains to be got by the cheaper transmissibility of power by the latter method. Thus, to take one important example, if the whole of the suburban railway services of Sydney were met by locomotive traction only, the annual coal consumption involved would be 247,671 tons, but with the whole system electrified the same work could be done with 118,600 tons.[43] It would thus seem that to the degree that electrical power production grows in Australia there will be considerable savings in the consumption of coal and equivalent contraction in the demand to be met by the coal industry. At the same time such growth will probably mean a net *increase* in the absolute tonnage of coal to be hewn, in so far as there comes about an improvement in the *per capita* power consumption of the country. The power generated *per capita* in Australia is somewhat greater than that in the United Kingdom; in 1923-24 it was about 241 units as against 204 units in Great Britain.[44] If the consumption of coal in electricity works in Britain is likely to be doubled by the consummation of the plan of the electrical authorities in that country to increase the *per capita* consumption to 500 kilowatts,[45] a similar estimate of increased demand for coal would be applicable to Australia were a like increase in electrical consumption achieved. The annual rate of increase in k.w. hours sold in Australia has, in fact, shown marked improvement in recent years—since 1920 between five and sixfold what it was annually for the previous ten years—but from the standpoint of national productivity needs still to be greatly augmented. It has been authoritatively shown[46] that whilst the American workman adds a value of £600 in the process of manufacture with 3¾ h.p. to assist him, the Australian, with the aid of less than 1½ h.p., adds a value of only £322.

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[41] Whose motto has been said to be: "Do your work, but do it as easily as you can," which means, in effect: "It is far easier to build a big fire; then fire as infrequently as possible."

[42] An estimate supplied by the Secretary, N.S.W. Government Railways and Tramways.

Consideration of electrical power production inevitably raises the question of hydro-electricity in its bearing upon coal consumption. What significance has hydro-electricity as a displacer of coal in Australia? In other parts of the world water-power is already a rival substitute of some magnitude. Between 1921 and 1926 hydro-electric power generated in Europe increased by

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[43] Except by what is represented in progressive electrification of services. Thus, on this account, the locomotives of the N.S.W. Railways required only 1,262,000 tons in 1927-1928, as compared with 1,342,000 tons in 1926-1927.

[44] Sir G. A. Julius, B.Sc., B.E., M.I.E.Aust., in his Presidential Address to the Institution of Engineers, 1926, p. 18.

[45] Lubin and Everett: "The British Coal Dilemma," p. 258.

[46] Sir G. A. Julius, op. cit., p. 12.

50 per cent., notably in Norway, Sweden and Italy. The growth of such hydro-electric horse-power since 1913, combined with purchases of Polish and German coal, has had, among other results, the effect of ousting large tonnages of British coal from the Scandinavian and Italian markets.[47] But it is easy to exaggerate the significance of water-power in substitution for coal-power. Even in the countries cited the absolute tonnages of coal consumed have continued to grow, despite the addition of the hydro-electric schemes. Irregular geographical distribution of water resources,[48] seasonal irregularities in its supply, high costs of transmission over long distances, and inadaptability of electricity for every use for which coal is serviceable, all conspire to set the limited range of hydro-electricity as a substitute.

So, too, in Australia hydro-electricity has already shown both its capacity and its limitation as a replacer of coal. This is best exemplified in Tasmania, where the water-power of mountain lakes and streams has been harnessed with commendable enterprise to serve the light and power needs of the State. This scheme has saved the island State a large annual expenditure on imported coals. But the very isolation of the excellent Tasmanian water-power sources from the centres of major industrial activity in the Commonwealth obviously discounts their utility from the national standpoint. The only other working hydro-electric scheme of any importance in Australia is supplementary to brown coal electrical generation in Victoria, but it is not comparable in magnitude with the Tasmanian. Before the adoption,[49] and subsequently in consideration of extensions,[50] of the use of brown coal as the main source of electricity for Victoria, the claims of water-power in Victoria were not overlooked, but exploration of all the potentialities within the State proved that at best suitable water power was available only as a source of minor supplementary supply. The same limitations exist in other States of the Commonwealth. It is clear, then, that hydro-electricity in Australia, while having already invaded, and while still capable of invading, some part of the field of coal, is not likely to become the potent rival of black coal conjured up in the popular imagination.

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[47] Lubin and Everett, op. cit., pp. 237-243.

[48] Only one-tenth of the increasing demand for electrical power in the United States can, for instance, according to engineering estimates, be obtained in that country from water-power sources. Hamilton and Wright, op. cit., p. 183.

[49] See "Report of the Advisory Committee on Brown Coal," 1917, p. 9.

[50] See "Report on Extension of Electric Supply System," 1928, p. 21.

There remains the consideration of fuel oils and motor spirits as displacers of coal. The products of petroleum find their use, of course, both in the stationary plants of manufacturing industry and in the moving vehicles of transport, but have by far the preponderating use in the latter field. In Australia oil-driven engines in factories account for less than 2 per cent. of the horse-power installed, a proportion which discounts the importance of the increase between 1915 and 1926 by 181 per cent. of the horse-power dependent on this form of fuel.[51] Comparable statistics of the increases of horse-power in transport are wanting, but it is evident from the growth of motor vehicles in Australia over a period of years that the absolute increase must have been enormously greater. Thus, between 1921-22 and 1925-26 the total number of registered motor vehicles in the Commonwealth grew from 136,848 to 390,300, an increase of 185 per cent.[52]

The significance in this growth lies in the indirect rather than in any direct displacement of coal which it in part represents. Some portion of the commercial motor vehicles, which grew from 13,438 in 1922-23[53] to 37,892 by 1925-26, or by 182 per cent., must, for instance, have deprived the railways of goods traffic, as the increase of motor cars from 99,270, and motor cycles from 37,578, in 1921-22 to 282,199 and 70,209 respectively in 1925-26 must have had a hindering effect upon the increase of railway passenger car-miles. What hindrance these developments in motor traffic have put upon coal consumption by the railways it is impossible to say; but in view of the embarrassments which railway administration in every State has had to face from the competition of the motor, the indirect effect upon coal cannot but have been considerable.

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[51] I.e., from 8,558 h.p. in 1914-15 to 24,116 h.p. in 1925-26. See "Commonwealth Year Books."

[52] "Commonwealth Year Book," 1927, p. 321.

[53] The 1921-22 and earlier figures are not available separately.

The displacement of coal-burning by oil-burning and motor ships in Australian ports is having a more direct effect upon the coal industry, in at least the section concerned with the bunker trade. This displacement is, of course, part of a world tendency and will be considered as an influence external to Australia in the following chapter. In so far, however, as bunkering in Australian ports is declining because of the less frequent appearance of the coal-burning ship, the problem is really one of the home market for coal. The present trend seems to be in the direction of a smaller bunkering business. Thus the gross tonnage of the motor-driven vessels entering Sydney Harbour comprised 2·5 per cent. of the total for all vessels in the year ending June, 1926, but was 3·8 per cent. during the following twelve months, the motor ships increasing in actual numbers from 86 to 150.[54] In the port of Melbourne the figures for the two years on the basis of tonnage were 3·1 and 6·5 per cent., respectively; if, however, ships burning oil under boilers be combined with those motor-driven, the proportions so represented in the total tonnage in 1926 and 1927 were 21·4 and 29·7 per cent., respectively.[55] These latter figures are sufficient testimony of the important and increasing place the oil-using vessel is occupying in Australian waters. It makes little difference to the fact of reduced bunker coal consumption that nearly all the oil-users at present are overseas vessels, that less than 10 per cent. of interstate tonnage is in the oil category, and that the use of oil in coastal vessels has scarcely begun at all. As a substitute for coal, oil in all three branches of shipping is destined to increase,[56] unless arrested by a change-over to pulverised black or brown fuel. So far this alternative has not proved practicable, but in its adoption alone there seems hope for a recovery of the increasing bunker losses which add to the distress of the coal industry.

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[54] These figures, from the Sydney Harbour Trust, do not distinguish oil-burning and motor ships, the oil-burners being included amongst steamers.

[55] Figures supplied by the Engineer-in-Charge, Ports and Harbours, Victoria.

The three foregoing Sections have attempted to separate into its elements the nature of the demand for coal in Australia. Viewed as a whole, it is an area of not greatly varying dimension, but certainly an area of shifting sands. The coal producer, despite the almost proprietary sense in the past of security in his field of sales, is now seeing its configuration change and is apt to lose his way as old land-marks become obliterated. It is an area upon which troublesome competitors have uprisen and are thriving, and from which the isolation of distance is not entirely able to debar competition in several forms from abroad. It is a land of troubles for coal; a land calling loudly for the wise adjustment of an industry still capable of high service to the nation and of fair and equitable livings to those whose services it commands.

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[56] At the time of writing (January, 1929), the P. & O., four of the Orient, the Aberdeen-Commonwealth, the Wilhelm-Wilhelmsen, the Roosevelt, and five of the Commonwealth and Dominion lines on the Australian service burn oil fuel. The latest addition to the interstate fleet of Huddart Parker Ltd. is also fitted for oil fuel.

CHAPTER VI.

AUSTRALIA AS A COAL EXPORTER.

I. WHERE AUSTRALIAN COAL IS SOLD.

Among the minor coal-exporting countries of the world Australia has for long held seventh or eighth place. In the pre-war quinquennium, 1909-13, the average coal export tonnages, not only of Great Britain, Germany and the United States, the three great coal-surplus producing countries, but of China, Austria-Hungary, Belgium and Japan, took precedence to that of Australia.[1] By 1925 the relative positions had changed to the extent that the Succession States of Austria-Hungary had fallen behind Australia, and revived Poland, re-aligned France, and China had pushed ahead of the Commonwealth. This is the position virtually as it is to-day, save that, by 1927, the South African exports of coal, which in the pre-war period took only eleventh position, had already exceeded the Australian total,[2] thus relegating the Commonwealth to tenth place among the world's coal exporters.

Before the war, moreover, Australia occupied a very high place among countries able to dispose of a large *proportion* of the national coal production by way of export. The proportion so disposed averaged no less than 30 per cent. between 1909 and 1913;[3] but by 1927 it had fallen to a little under 13.[4] It is this decline which has at last come to be recognised as a most serious forfeiture of a source of national wealth, as well as a breeder of much of the distress which to-day afflicts the coal industry. A further significant change lies in the altered proportions of cargo and bunker coals which comprise the total of exports. In 1913 ships' holds carried more coal from Australia than ships' bunkers, but to-day, with far less tons in each, bunkers exceed cargoes.[5]

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[1] See Tables in Annex IV. of League of Nations' "Memorandum on Coal," 1927, Vol. I.

[2] In 1927 Australia's coal shipments overseas were 1,690,000 tons, South Africa's 1,804,000.

[3] The percentages of national output exported by the more important countries elsewhere were: United Kingdom 32, Germany 18, Belgium 18, Japan 18, United States 5.

[4] I.e., to 1,690,000 tons out of a total national production of 13,511,000 tons.

What are the markets upon which Australian coal is sold overseas? Geographically they may be grouped into four areas of differing importance for the cargo trade, or, into five if the movement of coal in the bunkers of ships travelling to European ports be included.

New Zealand, by virtue of its purchases of about 22 per cent. of the Australian export surplus, is the largest of these marketing areas. About 25 per cent. of the total coal consumed in the Dominion (1,557,000 tons in 1927) is imported, and of the total imports (378,080 tons in 1927) Australia supplies practically the lot. While no single external market exceeds New Zealand in importance for Australian coals, the aggregate going to other overseas countries since 1913 varied between seven and three times as much as the exports to the Dominion. Exclusive of the coal carried in steamers' bunkers to the United Kingdom and other European ports, cargo and bunker coals from Australia go in next largest volume to markets in the Far East, which comprise a big area of trade. These markets, in the order of their importance, are the Dutch East Indies, the Philippines, British Malaya, Japan and China. American and Pacific Island ports constitute the geographical group absorbing the next largest aggregate quantities; while some bunker trade is done with India and, until 1924, with Ceylon.

As for a utility classification of the coals sold, the greater part are of steam-raising varieties for use not only in ships' furnaces but wherever in industrial plants fuel for quick raising of steam-pressure is a requisite. Coal for this purpose, as also for gas-making, comes mostly from the Northern New South Wales fields,

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[5] The respective exports from N.S.W. were as follows:

	Year Ended Dec., 1913.	Year Ended June, 1927.	1928.
Cargo	2,097,097	803,254	546,075
Bunker	1,372,441	899,413	841,227
Total	3,469,538	1,702,667	1,387,302

although a little, as well as most of the coking coal exported, goes from the Southern district of the same State. Queensland and Western Australian coals find their way into the bunkers of ships trading with the East Indies.

II. The Dwindling Export Trade.

What influences are modifying the demand for Australian coal outside the Commonwealth? An examination of the currents of overseas business over a period of years reveals some interesting causes of the instability and decline.

A cause of first importance in making for instability is the inescapable cyclic swing which gathers all nations in its rhythm. Since the war there have been two peaks of buying activity and two succeeding periods of slump in almost every country to which Australian coal is exported. The first of these peaks is revealed clearly in the figures of total Australian coal exports overseas, but the figures of exports to the separate markets have to be examined to show equally clearly the second of the upward movements (see accompanying graphs, Figures V. and VI.).

The phases of these alternations, as every student of the industrial cycle would expect to find, have not been synchronous for every coal-buying country concerned, but they have conformed broadly to the pattern of change in business conditions which Australia itself has experienced. Both in Australia and her overseas coal markets the first coal-buying peak was over the years 1920-21, whilst the second ranged over the years 1923-25. No satisfactory correlation can be established between an index of business conditions in Australia, such as the movement of wholesale prices in Melbourne, and the *total* sales of coal overseas, but, allowing for a lag of twelve months, fluctuations in the sales to New Zealand alone between 1915 and 1927 show a marked direct correlation with the price index, the co-efficient being ·777. Only the irregular tendency to *continuous* decline in the sales to a number of the other countries since 1921 prevents the establishment of a similar correlation between the

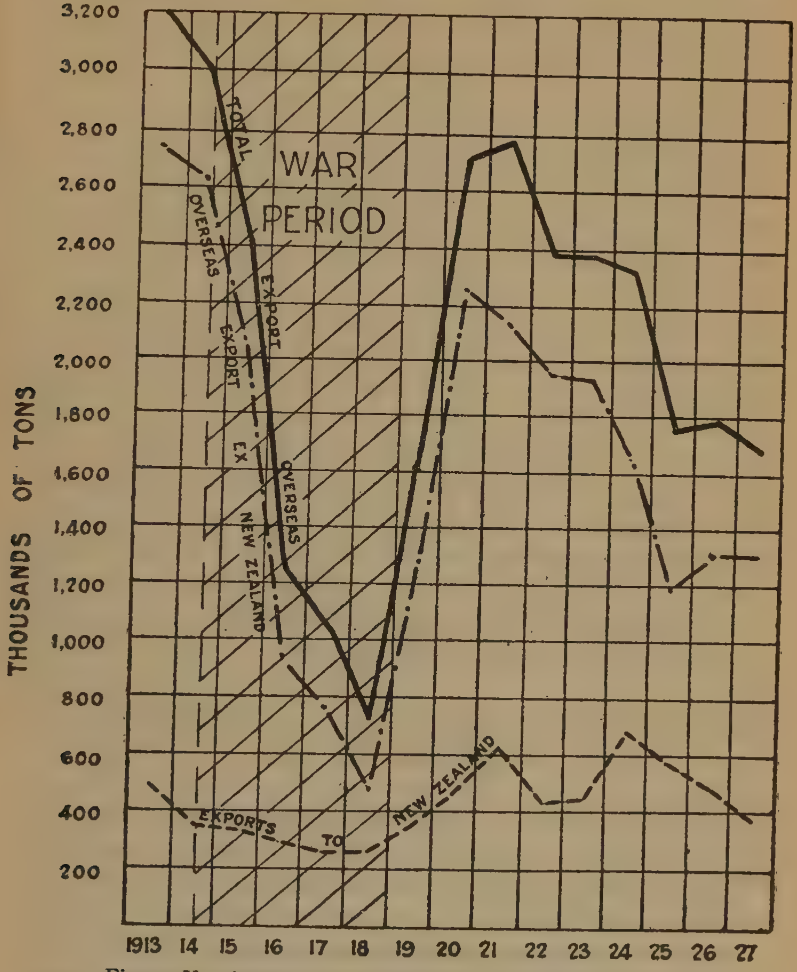

Figure V.—Australian Annual Coal Exports Overseas.

same index and total coal sales abroad. In any case, it is clear that Australian coal exports overseas have moved more or less with the changing phases of the general trade cycle.

It is to be expected that the fortunes of Australian coal exports across the Tasman should be closely dependent upon changing industrial conditions in New Zealand. The slackening consumption in that country of coal from Australia during the war (see Figure V.) was due not only to shortened industrial production, but also to the extreme difficulty experienced at times by New Zealand in securing adequate supplies from New South Wales. Immediately after the war there was a swift recovery in the volume of imports from Australia. Sales of Australian coal contracted, however, in the slump of 1922-23, but by 1924 had again recovered to a tonnage equal to the 1921 level. Thereafter, in 1925, 1926, 1927 and 1928, there has been a consistent downward movement.

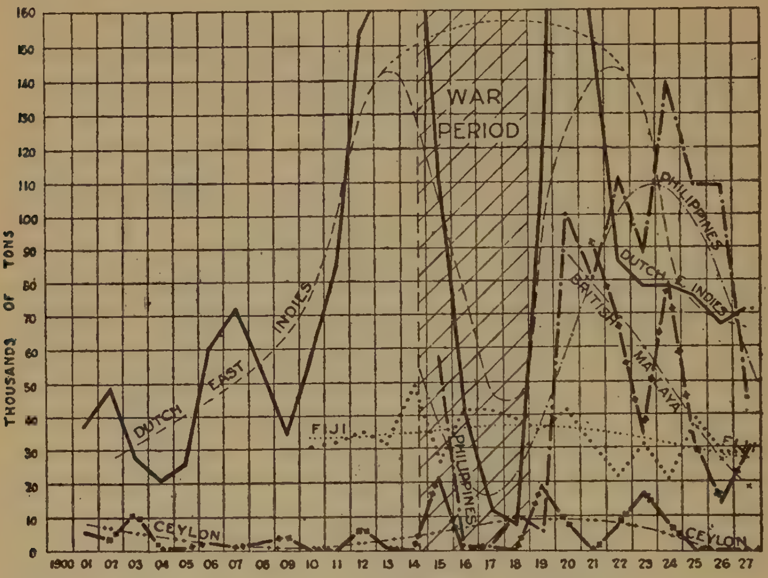

Figure VI.—Australian Annual Coal Exports to chief Overseas Markets, excluding New Zealand. General trends shown by smooth curves of five yearly moving averages.

New Zealand in 1925 began to enter a depression comparable to the period of uncertain business conditions in Australia beginning in the same year. As coal sales are largely a function of general industrial activity, it is clear that no lowering of the price of Australian coal in these last four years would have prevented a downward movement of exports to New Zealand. But it would be a wrong use of logical method to ignore price as a contributing cause maintaining the decline. New Zealand, like five of the States of the Commonwealth, is anxious to become far less dependent on costly and irregular coal supplies from New South Wales. She is pushing ahead her hydro-electric schemes and the fuller use of indigenous coals, most of which are relatively inferior. As the result chiefly of the use of hydro-electricity, the proportion of engines using steam as motive power to the total of all engines in New Zealand industries has fallen progressively from 64·7 per cent. in 1900-1 to 26·7 per cent. in 1921-22, and to 17 per cent. in 1925-26. These steam-driven engines in 1921-22 (when the figures were first recorded) represented 45 per cent. of the installed horse-power in the Dominion, but by 1925-26 they represented only 37 per cent. In 1900-1 there were, on the other hand, only 15 electrically-driven industrial motors in the country, representing only ·7 per cent. of the total engines employed, but by 1925-26 there were no less than 9,614, representing 74 per cent. of the total engines in use.[6]

From these figures it is clear that New Zealand, like Norway, Sweden and Italy, has been so enabled to supplement her industrial power requirements from a beneficent combination of topography and rainfall that her coal imports have been much lower than otherwise they might have been. Add to this the consistent increase in the output of her own coals,[7] and it will be readily inferred that New Zealand is a *relatively contracting* market for Australian fuel.

Figure VI.[8] shows the trend of imports of Australian coal over a number of years by some of the more important among the remaining markets overseas. The outstanding features of the imports into the Dutch East Indies, apart from the amazing growth of the share supplied by South Africa, have been the promising great increase of the share from Australia just before the war, its equally great declension in the period of hostilities, its remarkable recovery just after the war, its fall in 1922, and its subsequent steady decline. The key to the last recession is found in the big strides made in the annual production of Dutch East Indian coal itself, which has grown from 240,000 tons in 1901 to 949,670 in 1918, and to 1,466,359 in 1926, or to fourteen-fifteenths of the total requirements of the territories. The Indies are themselves now coal exporters with which Australia must reckon; for whereas the total exports and re-exports in 1913 were under 10,000 tons, they had reached 452,900 by 1926.[9]

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[6] These 9,614 motors represented 25 per cent. of the horse-power installed. Another 254, recorded as using "water" power, presumably included the hydro-electric turbines, for they alone represented 29 per cent. of the total horse-power installed. See "New Zealand Year Books."

[7] From 961,107 tons in 1919 to 1,196,384 tons in 1927.

[8] Constructed from data supplied direct to the author from official sources in the countries concerned.

In the Philippines local coals have for the last 13 years met only 8 or 9 per cent. of local consumption needs. These islands are essentially importers of coal. But what of the 90 per cent. which they do import? In two distinguishable periods since 1914 the percentages of coal imports in terms of countries of origin have been as follows:[10]

	1915-21	1922-27
Australia	9	21
Japan	67	32
China	18	33
East Indies (Dutch, British, French)	3½	10
Other Countries	2½	4
	100[11]	100[12]

Japan, it will be seen, has lost heavily to China, Australia and the East Indies. But, lest Australia should take too much comfort from this fact, it must be pointed out that the Commonwealth's share is a declining one in the second of these periods.

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[9] Figures supplied by H.M. Consul-General, Batavia.

[10] The figures upon which this classification is made are from the Bureau of Commerce and Industry, Manila.

[11] Averaging 450,000 tons.

[12] Averaging 483,000 tons.

The Federated Malay States, which produce an annual tonnage[13] of native coal somewhat less than the Western Australian total, are neither importers nor exporters of considerable quantities of fuel, and have little significance for Australia. British Malaya, on the other hand, is a heavy importer of Australian and other coals, and engages in an appreciable production of its own. Both imports and local production have shown increases in recent years.[14] The outstanding features of the imports have been the notable increase in East Indian, Burmese and South African coals, and the tendency to decline in Japanese, Chinese and Australian.[15]

Australian tonnages carried to Japanese and Chinese waters have, except in one or two years, been small, and are not maintaining themselves at all surely. Of the contracting tonnage of coal brought in or for bunkers in Hong Kong since 1922, the Australian share has been almost entirely swallowed up by other countries, notably by Japan, North China and French Indo-China.[16] In Japan since 1918 local production (round about 30,000,000 tons), while at a fifty per cent. higher level than before the war, has made no progress, whereas imports from the Chinese mainland have increased by 300 per cent.[17] It is noteworthy that the Japanese coal industry, apart from the handicaps of heavy freight charges incurred through the distance of the principal mines from the industrial centres, from defective loading and unloading facilities, and from high-cost ineffective labour, is faced with the increasing encroachment of cheap hydro-electricity.[18] In any case, it is evident that Japan must become increasingly dependent upon outside supplies for metallurgical coals, and it is equally evident that China and Manchuria, rather than other countries, will become the main sources of these supplies.

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[13] 463,000 in 1927.

[14] Imports from 533,343 tons in 1921 to 876,348 tons in 1927; local production from 299,351 tons in 1921 to 464,282 tons in 1926. Figures from Import and Export Office, Singapore.

[15] Imports of Australian coal have fallen irregularly from 92,941 tons in 1921 to 28,276 tons in 1927.

[16] From figures supplied by Chamber of Commerce, Hong Kong.

[17] From 694,000 tons in 1919 to 2,607,000 tons in 1927. (Bureau of Statistics, Imperial Cabinet, Tokyo.)

[18] "Japan Year Book," 1927.

China is a land of great and varied coal resources, which are already being subjected to considerable exploitation. About one-tenth of the annual output is exported, mainly to Japan, but also to Formosa and the Philippines. None the less, Chinese industries purchase extensively from abroad, the net imports having increased 130 per cent. since 1921.[19] The largest of these import tonnages come from Japan (virtually an exchange of about equal amounts of different kinds between the two countries), French Indo-China, Hong Kong and Russian Siberia. However, the industrial demands for coal in China itself as a whole are as yet not very keen, the greater part of the national coal output being used to meet domestic needs in a country where wood fuel is very scarce. Yet combined British and Chinese capital[20] is working industrial coals on an extensive modern scale in North China. The mines of the Kailan Mining Administration lie only about 80 miles from the nearest seaport, Chinwangtao, and have therefore relatively easy access to all Far Eastern markets.

Coal developments in Manchuria are also having, and are likely to continue to have, an important influence on the distribution of coal trade in the Far East. The Fushun Mines of the South Manchurian Railway Co., the largest coal-mining enterprise in the country, in 1927 produced no less than 7,000,000 tons of coal, of which about 3,000,000 tons were absorbed in Manchuria, another 3,300,000 tons exported to Japan, Korea and Shanghai, and about 700,000 tons sold for bunkers, despite a distance of 272 miles separating Fushun from the port of Dairen.[21] These mines are extraordinary, not only in the extent of their production, but in their methods of operation. A shallow overburden permits even bituminous coal to be worked with modern mechanical equipment by the method of open cut, and a similar mechanisation is applied to sand flushing in the inclined long wall extraction of the deeper coal. With an output growing from 223,000 tons in 1907[22] to 7,000,000 tons in 1927, and with its associated coal-winning, electric-power production, coke oven and chemical plants, railway, and miscellaneous industrial and social activities, the Fushun enterprise is an amazing example of "rationalised" industry.

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[19] From 1,151,000 tons in 1919 to 2,878,000 tons in 1926. (Government Bureau of Economic Information, Shanghai.)

[20] Notably in the Kailan Mining Administration. "The best quality of lump is sold almost exclusively for the bunkering of ocean steamships, but the bulk of the coal, apart from the slack coal sold for the manufacture of metallurgical coke in Japan, is sold for industrial purposes in North, Central and South China." (Letter from General Manager to the author.)

[21] Figures and other particulars from the Administrative Director.

In so far as both the Kailan and Fushun undertakings are an earnest of the possibilities of coal enterprise in the Far East, they exhibit elements of industrial leadership[23] on the Pacific basin of which the captains of the Australian coal industry might well take account.

Much of the Australian coal sold as cargoes eventually goes into bunkers in Eastern and Pacific Island ports. It is inevitable, with an increasing number of ships becoming oil-burners, that the demands upon coal in these ports should shrink. This fact, in part, accounts for falling away of Australian sales in the Pacific and, to some extent, of bunker coals in Indian ports. It means, in effect, that Australia is sharing with other coal vendors in the effects of the world-wide contraction in the demand for coal. In Hawaii, for instance, upwards of 200,000 tons were a year's coal importation at the beginning of the century; since 1923 it has not reached 50,000.[24] Practically all the United States naval vessels stationed in the islands are oil-burners, and the only industrial purposes for which Hawaii now imports coal (mainly Japanese) are electrical energy and gas production. The same trend is observable from examination of the coal import figures of Fiji. Australia is almost entirely the source of Fiji's bunker supplies, but these have fallen from 48,191 tons in 1914 to 28,711 in 1927. This falling off is probably associated with the decline in the number[25] of ships calling to take away Fiji's exports of copra, which have been slumping heavily since 1920.[26] But the substitution of the oil-burning steamship is also probably responsible. The displacement of coal is even more evident in ports where oil-bunkering facilities are provided, as in Singapore and in ports of India and Ceylon. Enquiries made by the Indian Coal Committee in 1925 showed that liquid fuel imports into Singapore rose from 13,394 tons in 1921 to 504,816 tons in 1923 and actual oil fuel bunkering from 368 to 196,646 tons. Liquid fuel imports into Colombo in 1922 were 103,197 tons and in 1924 161,575 tons; bunkerings, 77,823 tons in the former year, 126,773 tons in the latter. Similar increases were noted for Bombay and Madras.[27] Here, then, is an external cause of some of Australia's losses over which there can be no local control.

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[22] When the existing Company took over the property.

[23] Industrial leardership, said the late Professor Alfred Marshall, is "the power of doing now what others will presently be doing or trying to do." ("Industry and Trade," p. 26.)

[24] Figures supplied by H.M. Consul, Honolulu. N.S.W. sent 88,000 tons to Hawaii in 1913, but only 3,000 tons in 1926-1927.

India, after Great Britain, has the largest coal industry in the British Empire. Her total export and entrepôt trade, however, is not as great as Australia's. Between 1921 and 1925 an average of 770,000 tons, largely in bunkers, was imported into India, of which Australia's share was 44,000 tons, South Africa's 243,000, whereas, to take a pre-war quinquennium (1906-10), the shares of these two countries were 56,000 and 40,000 tons respectively.[28] Total imports into British India from all sources, however, including South Africa as well as Australia, are declining, while exports are tending to increase. Whilst the same is true of Ceylon, the inroads of South African and the recession of Australian coal are more striking. The average annual tonnage exported from British South Africa between 1908 and 1914 was 17,000, but since 1921 it has averaged 276,000, whereas that from Australia, little though it has always been, has, since 1924, entirely disappeared.[29] South Africa is to-day the most lusty of the belligerents in the "coal war of the Indian Ocean." Since the consummation of the Union in 1909 the total annual tonnage raised and sold has increased from 4,160,000 to 13,300,000, the amount bunkered from 1,327,000 to 1,838,000, and the quantity exported in cargoes from 138,000 to 1,804,000 tons.[30] No other coal industry in the Empire has made such progress.

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[25] From 147 in 1920 to 129 in 1924. (From "Colonial Reports, 1920 to 1924," published by H.M. Stationery Office.)

[26] Falling in value from £2,896,448 in 1920 to £1,498,934 in 1924. ("Colonial Reports.")

[27] See Appendix XIV., p. 170, of "Report of the Indian Coal Committee, 1925."

[28] "Indian Coal Statistics, 1926." (Indian Geological Survey.)

There remains to be considered the flow of Australian coal to American countries. In 1913 the total cargo coals exported from Australia to American ports were not far short of 1,000,000 tons, but by the year ending June, 1928, the total was scarcely 20,000. Here, then, is a major recession in Australia's coal export trade. What have been the factors in the decline?

The first noticeable feature of the sales to these markets has been their irregularity. This has been as true of Chile, the most important of them to Australia, as of Brazil, Mexico, Uruguay and other spasmodic buyers. Even the cargoes and bunkers going to the United States and Canada, countries which are linked by considerable general trade with Australia, have been most irregular over the years.

From 1900, and even earlier, Chile took annually at least 500,000 tons of New South Wales coal, and as late as 1913 absorbed nearly 700,000 tons. By 1920-21 the total trade had dwindled to 180,000 tons, and by 1927-28 had fallen away to nothing at all. The main cause of these changing fortunes for the Australian product has been development of the Chilean coal industry itself. Indeed, except for the period 1916 to 1921, when the United States became the main source of coal imported into Chile and imports from Great Britain and Australia fell considerably, the Commonwealth has only been sharing in a general squeezing out of foreign coals from

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[29] "Indian Coal Statistics, 1926."

[30] Figures from Office of Census and Statistics, Pretoria. It should again be noted that there is approximately only one white man for every 21 persons employed in and about South African collieries, and only one white man for every 38 persons at work underground.

Chilean ports. The growth of indigenous coal production in Chile may be measured by the combined output of its two largest colliery undertakings,[31] which increased from 587,088 in 1900 to 1,298,187 tons in 1927.

But in recent years the Chilean coal industry has itself fallen on evil times. As in other countries, forces have been at work to leave the number of collieries excessive in the face of a declining demand. The causes to which this position has been attributed are the opening of the Panama Canal, with a subsequent reduction of the number of ships calling for bunkers at the ports of Coronel and Lota; the numerous strikes from 1914 to 1923, which have helped to encourage the installation of oil burners in foreign vessels with fixed itinerary; the electrification of part of the Chilean railways; and the high relative costs of producing the national coal.[32] The great distance separating the nitrate fields in the north from the coal fields in the south led to the position, anomalous from the Chilean national viewpoint, of a ready outlet for Chilean bunker coal in the southern ports, but none where foreign ships were dumping cheap ballast coal in ports of the north. This anomaly, together with the impossibility of finding an inland market to make up for shrinkages in sales at the southern ports, influenced the Government to take the measures leading, among other things, to the entire exclusion of Australian coal in 1928. Following the report of a special Commission of enquiry in 1925, the Government adopted the policy in 1926 of protecting the national coal industry by placing on foreign coals, briquettes and coke an import duty of 7s. 6d. per ton, movable if need be to 12s. 6d., and a progressive duty starting at 1s. 6d. per gross ton on all petroleum imported for the use of Diesel or semi-Diesel engines, furnaces or boilers.[33] Since the imposition of these duties no coal has been imported, except odd lots from the Tyne, England, at very low prices and exceptionally low freights. As might be expected of protective measures of this kind, the Chilean coal owners are enjoying a temporary advantage, for which the nitrate producers are paying; but meanwhile there is no market for Australian coal in Chile.

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[31] The Cia. Minera e Industrial de Chile and the Cia. Carbonifera y de Fundicion Schwager.

[32] Per H.M. Consul General, Valparaiso.

[33] The same Act of Congress (Law, No. 4248) by which these duties became effective provided for the setting up of a Council for the development of the National Coal Industry, with a loan fund equal to the previous year's coal duty receipts appropriated annually. This fund was to be used for port loading facilities, the erection or subsidising of plants for the production of metallurgic coke or liquid fuel, lubricants and by-products, the purchase of coal ships, and for advances, up to 12s. 6d. for every ton ready for delivery, to coal producers who undertake to keep their establishments working.

Of the remaining South American countries, Peru has been possibly the least inconsistent buyer of Australian coal, the occasional large tonnages going to the Argentine and Mexico being more or less in the nature of windfalls.[34] Peru is compelled to be a coal importer. True, she possesses extensive fields of anthracite. bituminous asphaltites and lignites, but most of the fields are inaccessible. Such coal as is produced (round about 400,000 tons annually) is used almost exclusively in copper smelting. The large metalliferous mines have also been the chief consumers of the coal imported (which, between 1915 and 1925, ranged between 50,000 and 150,000 tons per annum), but railways, steamship companies and some of the larger industries of the capital are among the buyers.[35] The coal imports, however, have tended definitely to decline since 1919, and Australia, in still one more instance, is sharing with other coal vendors, including Great Britain and the United States, in the contracting demand. That this contraction may in the future become still more discomfiting to the coal vendors is suggested in the intention of the Peruvian Government to utilise the abundant water-power by State and private enterprise in hydro-electricity.[36]

III. THE MAJOR CAUSAL FACTORS IN THE DECLINE.

A summary of the significant elements in the foregoing analysis of coal movements in the markets with which Australia is concerned reveals the following facts:—

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[34] E.g., the 91,114 tons to the Argentine in 1926 merely replaced supplies interrupted by the coal strike in Great Britain.

[35] "Commerical and Industrial Handbook of Peru," published by U.S. Department of Commerce.

[36] "Government surveys show that over 4,000 different sites exist in Peru where 10,000 h.p. could be developed by building ten to fifteen miles of canals." "Manchester Guardian Commerical," 27th September, 1928.

(1) Australia has been sharing in the decline of coal consumption of the countries to which she exports coal.
(2) Native coals have been developed in several of these countries.
(3) Industrial fluctuations have disturbed the continuity of demand for coal by most of the countries concerned.
(4) South African, East Indian, Indian and Chinese coal exports have increased considerably at the expense of British, Japanese and Australian.
(5) The price level, as well as irregularity of deliveries, has placed an accumulating handicap on Australian exports.

The coal consumption capacity of all the countries enumerated is being affected by most of the influences, which we have called "substitutes," operating upon Australia itself. The more economical utilisation of coal is obviously not merely an Australian campaign against the law of diminishing returns. It is in evidence wherever electricity is placing more conveniently usable horsepower at the elbow of the consumer, and wherever more productive machinery and plant are replacing less productive. Coal consumption, too, is being markedly reduced wherever oil fuels, with all their economies of cost, cleanliness, space and labour saving, and general convenience, are finding favour, and this is specially observable in the many ports in which oil-bunkering is replacing the coals of Australia. Obviously, with more than half the tonnage now in course of construction in different parts of the world being motor ships propelled by internal combustion engines,[37] this is no tendency capable of being controlled from Australia. Not the least exemplification of the trend is "the permanent loss of the world's navies to coal."[38] The added influence upon declining coal consumption represented by hydroelectricity in some of the countries in which coal sales are of interest to Australia rounds off the work of the substitute.

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[37] See the evidence of Sir. E. Glover before the Royal Commission on the Coal Industry (U.K.), 1925, 25th Day, p. 4. "The gross tonnage of ships fitted to burn fuel oil grew during twelve months of 1926-1927 from 1,500,000 to 20,500,000 tons, a loss of sales to the coal trade (of U.K.) estimated at approximately 42,000,000 tons." Lubin and Everett: "The British Coal Dilemma," p. 250.

[38] Lubin and Everett, op. cit., p. 250.

The development of native coal resources in a number of the countries of our review is a phenomenon against which the Australian coal producer can have no complaint. Australia itself is a land in which the spirit of nationalism is strong, and where "Develop our resources!" is among the chief of political and industrial slogans. The only real danger of a competition in nationalism which produces the Chilean experiment of protection for coal is futile imitation by other countries under similar stress. This is no final solution economically satisfactory to the communities concerned. If Australian coal is to win and retain a trade in lands with coals of their own, it will only be because it can be produced under genuine conditions of comparative advantage; or, in other words, because its quality-multiplied-by-cost offers greater attractiveness to the buyer than the same product in his native coals.

Industrial fluctuations on Australia's overseas coal markets are less a cause of decline than a cause of instability of sales. They may, however, be a *conditioning* cause of a long-period decline. For in a phase of general industrial depression the coal-using manufacturer inevitably casts about for whatever economies he may effect in costs. He is normally not fickle in his use of fuels, preferring to keep to a type and quality recommended by the common usage of his craft. When depression falls upon his industry the pressure of costs may first drive him, anomalous as it may seem, to the purchase of the highest-priced coals, which, because of better performance, offer greater economies than "cheaper" lower-grade coals. This happens commonly enough in Australia.[39] But it may so occur that the price of the high-grade coals reaches heights which destroy the net economies hoped from their use, and the tendency for the manufacturer will then be to seek his economies from a combination of furnace and other technical improvements with the use of fuel cheaper than is his wont to purchase.

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[39] Not always necessarily under the pressure of depression.

In this we find some explanation of the progressive displacement of the high-grade Australian coals by inferior, but lower-priced, native coals in a number of the countries reviewed. Every cyclic depression felt by the industries of these countries has swung the cost-reducing manufacturer to the second of the types of economy discussed. In this sense, therefore, industrial fluctuations abroad have united with the stepping up of high coal prices at home to produce a cumulative decline in the overseas sales of Australian coal.

The operation of these factors has further constituted the opportunity for South African, East Indian, Indian and Chinese export coals to offer the overseas purchasers of Australian coal in other countries beside their own the economy of cheaper fuel. The amazing increase in sales of South African coal in the various markets we have already stressed. Export coal from Natal collieries compares very favourably with the best from New South Wales, and is worked under conditions of at least equally favourable physical and more than favourable labour costs. Thus the prices quoted for South African fuel, even in East Indian ports, despite a long sea voyage, can be made lower than Australian. In addition, a safeguard has been guaranteed to overseas buyers by the Union Government, under the Coal Grading Act of 1922, by the prohibition of shipment of any coal not approved by the official Grader, who must satisfy himself as to the screening and cleaning of the coal. The Act provides for the appointment of a Committee, which fixes the standard and issues certificates of grade for all bunker and export coal. Samples are taken of every shipment of bunker and export coal, and are tested for size and calorific value. *Thus Natal coals are standardised.*

These conditions alone might reasonably be expected to account for the competitive advantage of South African cargoes and bunkers. But a further feature, highly noxious in its effects upon the coal-bunkering trade in Australian ports, has been introduced into South African Government policy for the purpose of winning business. The South African Railway Administration will allow a rebate of 7s. 9d. per ton of 2000 lbs. on all surplus South African coal taken aboard as bunkers at ports of the Union, provided not less than 100 tons remain on board at the final port of discharge.[40] Clearly, with South African ports so situated as to catch a considerable flow of shipping trade by the southern route linking seaboard centres in Europe, America and West Africa on the Atlantic side with East African, Indian, East Indian and Australian ports bordering the Indian Ocean to the east, business strategy in the Union has made the most of geography. To this national stimulus to business may be attributed, in part at least, the maintenance in Durban alone of a bunker trade half as much again as the volume to which bunker sales have fallen in Australia.[41] Even if the spirit of retaliation in Australia were wise, it could not express itself in very effective measures against the African advantage.

Added to the South African system of rebates to shipping companies is another of rebates to colliery proprietors, who receive back no less than 57 per cent. of the railway freight charges on all coal shipped as cargoes. It was this concession on costs of South African coal shipped to India and Ceylon which caused the Indian Coal Committee of Enquiry in 1925 to recommend the increase[42] of a similar type of rebate on Indian shipment coals, action which has helped to place India among the coal exporters ousting Australia from the markets of the Far East. The best Indian coal could in any case compete on quality in any market in the East, but, much of the coal exported having fallen into bad repute, the Coal Committee felt impelled to recommend the imitation of South Africa in a second respect in the setting up of a Grading Board;[43] but the step of rebating on bunker purchases was not considered to be warranted.

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[40] From "Bunkering at Port Natal," published by Mann, George & Coy. (S.A.) Ltd., Durban.

[41] Total bunkers sold in Durban, 1926-27, were 1,256,276 tons; from N.S.W., 1927-28, 841,227 tons.

[42] From 25 to 37½ per cent. See "Report of Indian Coal Committee," 1925. Par. 62, pp. 60 and 61.

Thus governmental action has been invoked in both South Africa and India to secure a larger slice of overseas coal trade for the national industries. No such extraneous aids have been necessary to increase the competitive strength of surplus East Indian and Chinese coals. They are winning out against some of their competitors in the Far East mainly because of geographical advantage and partly because of low price based on abundant low-priced labour. Yet in China, as we have seen, the lower costs of production in the largest mines operated in part by foreign capital are being rooted in methods of the most advanced technical efficiency.

It is clear that price is central to the many-sided problem of declining overseas sales of Australian coal. A later chapter will examine the factors in the cost of producing coal in Australia, but here only the effects on the trade abroad of the high level reached are brought into relief. One further element must, however, be considered. The price of coal is not merely the money assessment of the value of a ton. Certainty or uncertainty of deliveries by a stipulated date really discounts or adds a premium to a quoted price. It is because uncertainty has come, in the minds of overseas buyers, to be associated with purchases of coal from Australia that orders have been placed elsewhere. Such of the buyers, more particularly, who send ships for cargoes to Newcastle can never be reasonably sure at what cost of time and money their purchases will be made. It not infrequently happens that vessels coming on long voyages cannot get cargoes for weeks, because of sectional stoppages on the coal-fields or water-fronts, with consequent losses to their owners or charterers, who have to pay idle crews, harbourage dues, and other unreproductive costs. The significance of these vexations is much greater for the industry than the miners[44] have been willing to admit. It is certain, on analysis, that in the Far Eastern markets Australian coal could hold its own, even at a high price level, if large buyers could be assured freedom from continued hold-ups and interminable delays in getting the Newcastle product.

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[43] "Report," ibid, Pars. 2 and 84.

The recognition of this fact and of the implications of irresponsible action on the coal fields is the necessary preliminary to any action which may yet save Australia from losing utterly her place among the exporters of coal.

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[44] Except, it should in all fairness be stated, the responsible officials of the Miners' Federation. See, e.g., evidence of the General Secretary (Mr. D. J. Davies) before the Royal Commission, 20th June, 1929.

PART II.

THE PROBLEMS OF THE COAL INDUSTRY.

CHAPTER VII.

THE CENTRAL PROBLEM OF OVER-CAPACITY.

I. The Relative Constancy of Demand.

The foregoing chapters of this book have sought to bring into relief the salient structural aspects of coal exploitation in Australia and to examine the more patent of the causes creating difficulties in the sale of the product. But it is necessary to go deeper for the causes producing what is now, and is likely to be for years, the puzzling dilemma of coal in Australia.

Some of these causes are not peculiar to coal production in Australia alone; some, on the other hand, have their origin in the local setting. Some, again, arise from changes inevitably taking place outside the industry; others from the relative inadaptability of the industry in the face of these changes. The several sets of causes are closely interwoven. Reduced to the language of the economist, they demonstrate the peculiar inter-action of demand, supply and price in an over-developed industry.

The nature of the *demand* for coal itself is unlike that of the demand for most other products of the industrial world. It is not a specialised product, but a raw material of far more varied application than almost any other used by industry.[1] By far the greater part of the coal consumed in Australia, as elsewhere, is for industrial purposes, mainly for the needs of heavy and light manufacturing, electrical power and transport.

The demand represented by these uses is widely spread. It is, moreover, in the aggregate, relatively constant; at any rate, tending to grow with the *same degree of steadiness*, if not at the same pace, as secondary industries as a whole. Even when there happens to be a considerable increase in secondary production (as, say, in 1912-13, 1919-21, 1923 and 1925) or a considerable decrease (as in 1915, 1918, 1921-22, 1925-26 and 1928), and the *total* amount of coal produced and consumed tends to vary accordingly, the changes in *total* demand are little affected by changes in the price charged. Or, to put it another way, the total amount used for industrial or even domestic purposes in Australia does not decrease much with a sudden rise in coal prices (as when 4s. a ton was added in New South Wales in 1920), nor increase considerably with a sudden decrease in coal prices.[2] This is not to ignore the fact that the demand for a *particular* coal in a *particular* market open to competition may respond very readily to price changes; but the net effect is normally to replace one coal by another, not to change the total demand for coal.[3]

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[1] Its only serious rival is possibly iron.

Coal, as a commercial product, has an inelastic demand, *i.e.*, the demand is relatively fixed in amount and does not fluctuate quickly with price changes. That is the main fact to be kept in view in an understanding of the coal problem. Yet, of course, if the price be raised inordinately, and be kept at a very high level for long, the opportunity is provided for cheaper substitutes to come in and steal away its custom. That is precisely what has been happening in all countries since the first big impetus to the substitute was given by the inordinate coal prices of the war period and of the four years following the cessation of hostilities. In Australia the troubles that were to come upon coal through price were given an even longer period to incubate. The substitute in its various forms[4] has been gradually accumulating the power which in 1928 and 1929 was to bring a measure of paralysis upon the black coal industry of the country.

Experience is already teaching one hard lesson in the economics of coal. A rise in the price of coal is more certain to increase the available substitutes, such as electricity generated from brown coal, hydro-electricity, motor spirits from petroleum, than a fall in its price to increase the demand for coal itself. Already, as previous chapters have shown, these substitutes have found a secure lodging in Australia. This is at least evidence that the price charged for coal will eventually give some elasticity to its demand.

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[2] E.g., the generally lower level of quoted prices for railway contracts in N.S.W. in 1928, as compared with 1927, did not induce any greater demand for coal by the Railways.

[3] The coal consumed by a factory is a function of the technical requirements of the boiler plant, just as bread consumed is a function of the physiological requirements of the body.

[4] Including, as far as Australia is concerned, even other black coal from abroad.

II. THE IRREGULAR DEVELOPMENT OF RESOURCES.

If we examine the conditions which prevail in the *supply* of coal, more particularly in Australia, we see the counterpart which invites embarrassment from an inelastic demand. In Australia, as in other major coal fields of the world, there are still vast stores of unmined coal. Like other important coal-owning countries, the Commonwealth possesses some fields that are very rich in the quantity, quality and variety of the coal deposits, and some that are less rich, ranging down to deposits that are relatively poor. Whether a particular deposit will be worked depends, as shown in Chapter II., far less on the quantity available than on the quality and, more particularly, on its cheapness of operation and the cheapness of transport to the market.

It often happens, then, that a relatively low-grade coal deposit, not over-costly to work and cheap to transport because near some big industrial centre or within easy reach of the lines of a railway administration prepared to use inferior fuel, will be opened up and compete with better grade coal from more distant mines. The coal of Wonthaggi, Victoria, *e.g.*, is of a generally poorer quality than Maitland (N.S.W.) coal, but has a close and assured market in the Victorian Railways, and to a small extent in the manufacturing industries of Victoria. At the present rate of exploitation, Wonthaggi coal may last another 40 years, Maitland coal several hundreds of years. The Yallourn lignite deposits in Victoria are, of course, an even more striking example of the present exploitation of handy low-grade fuel at a time when higher-grade fuels are still, from the national standpoint, available for use.

The same thing, with modifications, may be said of coal deposits now being worked in Queensland, Tasmania and Western Australia. The several scattered coal fields of Queensland, although not possessing coals suited for every industrial purpose, have the advantage of fairly high-grade quality; and, although denying some of the economies of concentrated production to Queensland industries, have themselves the advantage of widely scattered markets. At any rate, as has several times been stressed, the tapping of coal deposits in Queensland by some 70 collieries spread over ten different fields has been part of the competitive challenge offered to the older industry of New South Wales. In Tasmania, too, four or five working fields are able, because of location rather than quality, to secure about half the total custom of the island, and one or two mines are even planning to compete with Newcastle for the mainland trade of Victoria and South Australia.[5] In Western Australia, as we have seen, remoteness from Newcastle by a long sea voyage and an assured monopoly of the Government's custom have caused the vigorous exploitation of the inferior deposits of the Collie field.

It is obvious, then, that local rather than national economic considerations determine the channels that are cut by the flow of coal supply in Australia.[6] That some of these channels at times run a "fresher" and at other times are as dry as a western river in the summer season, and that the flow in all channels together at no one time reaches the height of the banks that have been cut, is the evidence of a procedure in coal exploitation confounded by the deceits of demand.

III. THE NEMESIS OF OVER-CAPACITY.

The uneven distribution of the coal resources of a country inevitably tends to irregular development of its coal industry. That is the position Australia is facing to-day. It further results in the multiplying of mines and mine-workers beyond the number that can reasonably be employed to satisfy an inelastic demand. In other words, the laudable ambition of each State to develop its coal resources to the utmost has hastened the nemesis of over-capacity.

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[5] The main obstacle to these plans is the difficulty of shipping facilities.

[6] See map of Distribution of Coal Production in Australia, Figure II., p. 21.

While it is true that secondary production in Australia has been making a steadily increasing demand for coal, the net increase year by year has not warranted the opening of as many new mines as have appeared. The net increase could be more than met by the productive capacity of those already existing. In 1927, 241 collieries,[7] big and little, were responsible for the Commonwealth output of 13,522,000 tons of black coal (see Table X.). Of the mines already producing, 140 were operating in New South Wales and produced 11,126,114 tons, 98 of them working on the Northern fields and producing 7,145,116 tons. The 140 mines in New South Wales, employing 24,483 men, had, on the average, a working year of 189 days or of 4,650,000 man-days which gave the output of 11,126,114 tons. Given an average of 250 days as a conservative workable maximum, a possible 6,125,000 man-days could have been worked, with a product of 14,700,000 tons. Given an average of 274 days (*i.e.*, 365, less Sundays, "back" Saturdays and holidays), the man-days might have reached 6,670,000 and the output 16,000,000 tons. These estimates exclude the possible output of nine large pits maintained in working condition but not producing during the year, and of four mines in varying stages of development. Had the remaining collieries in Australia all worked to an average of 250 days, they could possibly have increased their aggregate output by 25 per cent.

These simple calculations point to the conclusion that the demand for coal in 1927 could have been met with three-quarters of the collieries and colliery equipment

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[7] If collieries in a stage of development which did not produce in that year but were kept in a condition of readiness to operate if necessary are included, the number would exceed 250, or about 10 per cent. of the number (2,500) ordinarily operating in Great Britain.

TABLE X.

DISTRIBUTION, IN OUTPUT SERIES, OF BLACK COAL PRODUCTION, AUSTRALIA, 1927.

OUTPUT SERIES Tons.	NEW SOUTH WALES.					QUEENSLAND.		VICTORIA.		TASMANIA.		WESTERN AUSTRALIA.		COMMONWEALTH.	
	North	South	West	State.											
	Mines.	Mines.	Mines.	Mines.	Output.	Mines.	Output.	Mines.	Output.	Mines.	Output.	Mines.	Output.	Mines.	Output.
Under 1,000	16	1	5	22	8,757	10	3,686	3	348	4	1,112	1	201	40	14,104
1,000– 5,000	18	—	3	21	60,700	9	27,559	5	13,180	1	1,319	1	1,466	37	104,224
5,000– 10,000	7	—	1	8	57,934	10	76,759	2	13,149	—	—	1	9,572	21	157,414
10,000– 25,000	6	1	3	10	177,638	30	480,653	3	46,950	2	34,463	—	—	45	739,704
25,000– 50,000	13	2	1	16	571,831	9	302,824	—	—	2	75,092	—	—	27	949,747
50,000–100,000	16	1	7	24	1,813,914	3	207,558	—	—	—	—	1	81,682	28	2,103,154
100,000–200,000	10	6	6	22	3,009,648	—	—	—	—	—	—	3	408,583	25	3,418,231
200,000–300,000	5	3	—	8	1,938,497	—	—	—	—	—	—	—	—	8	1,938,497
300,000–400,000	4	1	1	6	2,080,674	—	—	—	—	—	—	—	—	6	2,080,674
400,000–500,000	2	—	—	2	906,500	—	—	—	—	—	—	—	—	2	906,500
Over 500,000	1	—	—	1	500,021	—	—	1 (*a*)	610,618	—	—	—	—	2	1,110,639
Total	98	15	27	140 (*b*)	11,126,114	71	1,099,039	14	684,245	9	111,986	7	501,504	241 (*b*)	13,522,888

(*a*) Comprising five connected pits of the State Mine.

(*b*) This total is exclusive of 9 mines not producing, but maintained in working order, and of 4 mines in a developmental stage with no output.

then existing. A not dissimilar situation can be shown for any year in the last decade. The wide disparity between possible and actual output shows, moreover, that no new collieries at all were necessary to meet the small net increase in the national production since 1920. In other words, there is far too great productive capacity in the Australian coal industry.

The method of estimation which we have adopted may be accepted as a reasonably approximate measure of over-capacity. As 189 days actually worked is an average, weighted according to the number of employees in particular mines, the estimates do not neglect to take into account the bigger number of man-days worked by collieries producing, in the conditions of the stage of development reached, not far short of their full capacity. But the method cannot reveal the degree of over-capacity represented, through neglect of less profitable working faces, by concentration of all available labour on the more profitable. On the other hand, as short-time in mines may be due to technical hold-ups[8] making the consistent attainment of even 250 working days impossible, it may be that the estimate of potential capacity is somewhat exaggerated, though not sufficiently so to invalidate the correctness of the general conclusion.

The fact of over-capacity is further illuminated from an analysis of the manner in which the market is fed by collieries of different size. Table X. shows the distribution of black coal production in Australia in terms of an output series by size of mines. Forty-three collieries with an output of over 100,000 tons each, or 17·8 per cent. of all the mines producing coal in 1927, had an aggregate output of 9,454,541 tons, or 69·9 per cent. of the national production. Thirty-nine of these collieries were in New South Wales and alone accounted for 62 per cent. of the national output. Of the 43 in Australia, fourteen, with an output each of between 200,000 and 400,000 tons, accounted for 29 per cent., or not far short of a third, of the Commonwealth total, and four of them, with an output each of upwards of 400,000 tons, for nearly 15 per cent. Seventy-seven mines or pits, with less than 5,000 tons each, together failed to produce one per cent. of the national total.

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[8] E.g., the Mount Mulligan mine, in Queensland, was idle half-time towards the end of 1926, owing to a dam giving out. (Queensland Department of Mines "Annual Report, 1927.")

Now, while this is evidence, as mentioned in an earlier chapter, of considerable concentration of production in large collieries, it also indicates that a large surplusage of minor collieries are nibbling at a market neither big enough nor, because of the manner of coal exploitation in Australia, likely to become big enough to take off the potential supply. This is still true even if the existence of certain of the smaller collieries be allowed to be economically justified because of special qualities of coal they purvey, or because of efficient operation or advantageous location. If 43 collieries working on the average only seven-tenths of their full time account, under existing conditions, for three-quarters of the national production, a simple calculation will show that, working at full capacity, they could produce the lot. Clearly an irregular development of Australia's coal resources has invited too many enterprisers to try their fortunes in a lottery which promises, but fails in performance, to give prizes to all.[9]

Brief reference to the analogous situation in the United States bituminous industry will be instructive. In 1926, 1,668 collieries with an output of over 100,000 tons each, or 23·3 per cent. of the total of 7,177 mines, produced 79·1 per cent. of the national coal output. Of these 1,668 large mines, 823 had an output of over 200,000 tons each and produced 58·1 per cent. of the national total; whilst 569 of the 823 with a range between 200,000 and 500,000 tons produced 32·8 per cent., and the remaining 145, with over 500,000 tons each, 20·9 per cent.[10] Allowing for the great disparity in the magnitude of the two industries, this appears to show a somewhat greater concentration of production in large collieries in the United States than in Australia.

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[9] An example of a major enterprise contributing to excess mines in an already over-developed coal district is the Broken Hill Pty. Coy. Ltd., at Newcastle, which has two new collieries in development. This large iron and steel manufacturing company has been led to take this step in order to be able to get at least part of its coal at a price determined by its own costs of production, and in order to have an uninterrupted supply.

[10] "Coal in 1925" and "Bituminous Coal Tables, 1926," of the U.S. Bureau of Mines.

Cyclic changes in American business conditions since 1913 have, however, caused great variations in the total number of mines and in the proportion represented by large enterprises in different years. They have, incidentally, intensified the over-capacity from which the bituminous industry has never been completely free for 40 years,[11] and, despite slaughter of the unfit on an almost dramatic scale, have left surviving coal producers in America the victims of a disquiet even more perturbing than is known by coal proprietors in Australia. In 1913 the total number of commercial mines in operation in the United States was 5,776, of which 12 per cent. were collieries with an output of more than 200,000 tons. The after-war boom from 1918 to 1923 increased the number of commercial mines to about 9,300, with between 2,400 and 4,800 additional "snow-birds,"[12] the proportion of the large mines of over 200,000 tons output falling to from 4·5 to 9·8 per cent. Conditions since 1923 have ruthlessly squeezed out a large number of smaller enterprises, causing a revival of concentrated production. Whereas mines with an output of over 200,000 tons each, representing 4½ per cent. of the total number of mines, produced 32½ per cent. of the total national output in 1922, they had become 11½ per cent. in 1926 and produced 58 per cent. of the national total.[13]

There is little evidence of similar great variation in the number of mines operating in Australia. The number of collieries has increased steadily since 1913, but it is deducible from the analysis already made that the rate of progress has been too fast for the real consumptive capacity of the country. The larger mines have managed to secure about the same proportionate share of the total increase in production year by year. Their number, however, has grown more slowly than the number of smaller enterprises.[14] The tendency to concentration in the production of coal is thus operating more slowly and steadily in Australia than in America.

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[11] "From 1890 to the present, the industry has at all times stood ready to produce much more coal than the country could use." Hamilton and Wright: "The Case of Bituminous Coal," 1926.

[12] Small pits opened temporarily. Also known as "wagon" mines and "fly-by-nights."

[13] "Bituminous Coal Tables, 1926," ibid.

The question may justifiably be raised why there should be any such thing as over-capacity as a long-continued phenomenon in any industry in which competing units strive for a share of the market. Will not the capacity to produce eventually relate itself to the market's capacity to absorb the product? But to put the question thus is to miss a necessary distinction between over-capacity and over-production. Over-capacity may be a permanent condition giving rise to over-production on occasion. Production must accommodate itself to the demand of the market more or less quickly. Capacity to produce, in the meaning that under-employed men and materials stand ready to produce, may, on the other hand, continue for years to remain in a state of mal-adjustment to actual demand. Unused capacity is probably a condition with which every industry is familiar.[15] But coal mining is one of those types of enterprise in which, by its very nature, excess capacity is a normal condition rather than an abnormal.

Consider the uses to which capital invested in coal mining is put. In the early stages of development large sums must be spent upon the labour alone of reaching the coal face—money used for making holes in the ground and rendering them safe for later working. Much of the plant below and on the surface of a colliery—timber, rails, skips, hauling machinery, screening apparatus—is not only costly but little fitted for other industrial uses. Even the costly coal hoppers and trucks,[16] which most sizable collieries on the Northern fields of New South Wales possess, are capital equipment not easy to liquidate in times of need. It is because of the nature of the equipment assets in coal mining that the coal enterpriser, even when trade is bad, prefers to keep his mine open, though it mean nothing more than maintaining it in going order with equipment intact, rather than to seek to liquidate his assets for investment in some other field of industry. It may, for the time, mean little or no profits. But an open mine, with its community of dependent miners, may at least get an occasional order from a market incapable of employing all mines and all miners at full capacity, and that is better for the proprietor than a complete loss of his assets.

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[14] The number of collieries in N.S.W. with output over 100,000 tons each, growing from 34, with a total production of 7,470,716 tons in 1922, to 39, with a total output of 8,435,340 tons in 1927. The number with less than 100,000 tons each fell from 112, with total output of 2,712,417 tons, to 94, with total output of 2,690,774 tons.

[15] "Whereas normal business, as measured over the course of years, represents the use of about 60 per cent. of the industrial capacity that has been built up to meet peak demand, to the business man normal means 'rotten' business, and 'normality' exists for him only when the business machine is running at about 85 to 90 per cent. of its highest rated speed." Paul M. Mazur: "American Prosperity: Its Causes and Consequences," 1928, p. 122.

Over-capacity, in the sense that far too much irrecoverable capital equipment is demanding some return and far too many wage-earners are demanding something above the Australian basic wage conditions of living, has ministered to a high price level for coal, most of which finds its sale in a market *hitherto naturally protected by its isolation from external competitors.* The concentration of the best of Australia's coal in one region, the Northern district of New South Wales, has further given the most important collieries in that area a virtual monopoly power to set a price-level, permitting from less well-endowed fields a competition not greatly to be feared. This indulgence, it is true, has been less an act of grace on the part of the Northern coal proprietors than the result of pressure from the miners for higher earnings. But the net result has been a price-level for coal, rising by steps to heights sufficient to attract new colliery operations, and finally to produce the existing over-capacity.

The coal industry has for a number of years been carrying a heavy overload of costs. The maintenance of the excess mines and excess miners contributes heavily to this overload, which is borne by the poorly recompensed investors in mining enterprises, by the under-employed mine-workers, and by the over-charged consumers. Many mines must close up and, possibly, 5,000 mine-workers be absorbed in other occupations before this part of the cost overload can be cut down, overseas trade in a measure recovered; the industry be made a healthy investment, and mining for all workers engaged become a full-time, generously-paid occupation.

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[16] A typical coal truck costs about £450. An average size colliery would own at least 150 such trucks.

Evidence of the over-capacity in labour supply is to be read plainly enough from sober statistical records. Whereas the number of persons employed in coal mining in New South Wales in 1925, 1926 and 1927 was nearly 30 per cent. greater than in 1913, the total output of coal was only 9 per cent. more in 1925, 4 per cent. in 1926, and 6¾ per cent. in 1927.[17] Concurrently, as indicated in part in Table III. of Chapter III., there has been a decided drop in the tonnage output per mine-worker employed—from 735 tons in 1913 to 607 tons in 1927 per worker below ground, and from 553 to 451 tons per worker in the industry. Here, then, is evidence of a disparity between productive capacity in man-power and actual production.

There can be no satisfactory escape from the dilemma of the coal industry until the embarrassing over-capacity and overload of costs are reduced. It is inevitable, under the present conditions of tension, that owners should want a drastic wage cut for *all* mine-workers rather than the maintenance of a high wage for *fewer* mine-workers in *fewer* collieries, and that the workers should imagine great profits to be where few exist. But each of these attitudes is an evasion of the central difficulty of the industry.

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[17] See Mines Department's "Annual Reports." That the over-supply of labour does tend to remedy itself is shown in the drop in numbers employed in N.S.W. from 24,400 in 1927 to 21,500 in 1928.

CHAPTER VIII.

THE PROBLEM OF INDUSTRIAL DISSIDENCE.

I. Disputes in the Industry.

Wherever there is a coal industry there is a field ready for the seeds of dissidence or already ripe with a harvest of troubles. Even when coal mining is for the time being in comparative repose after one of the great-scale struggles which it periodically contributes to the industrial drama, it is never entirely quiescent. It is, indeed, an industry in which disputations, if not disputes, enter into normal relationships between the managerial and operative factors in a degree that for other industries would be quite abnormal.

The coal industry in Australia, regarded as a whole, lives loyally by this tradition of the craft of mining. No other single industry in the Commonwealth can equal the record of coal mining, either in the contribution it makes through disputes to the aggregate of the idle working days of each year, or in the consistency with which it can be expected to repeat its general experience year by year. Figures were quoted towards the end of Chapter III., it will be remembered, to show that, of all the 3,701 industrial disputes leading to stoppages in Australia from 1920-1927 inclusive, not less than 70 per cent. were in coal mining, and that nearly all of these were within New South Wales. It is, indeed, due to the fact that the main seat of coal mining lies within the borders of that State that New South Wales is pre-eminent in the records of industrial troubles in Australia. If the period 1914 to 1924 be lifted out for examination from the records of the New South Wales Department of Labour and Industry, it is seen that of the 16,000,000 working man-days shown to have been lost through dispute dislocations, no less than 7,820,000 were lost by 21,000 coal and shale mine-workers, as against 4,800,000 by 615,000 workers in non-mining industries and 3,380,000 by 11,000 workers in metalliferous mining. In the year 1924, in which the coal industry reached a record of coal production, there were no less than 482 disputes in the industry, involving a loss of 516,137 working days, and representing the bulk of the 520 disputes, aggregating 611,135 days lost, with which the industries of the State were afflicted in that year.

To what special causes is to be attributed this marked proclivity to dissidence between employer and employee in Australian coal mining? Is it due to the strength of union organisation among the mine-workers, or to some special weakness in all the machinery for conciliation which fresh ingenuity has, with indifferent success, from time to time devised? Or, if not lying in these superstructures of organisation, do the causes lie either in the nature of coal mining itself or in some special quality of mentality in the disputants themselves? Or is it true, as not a few zealots believe, that the coal industry in its existing ownership and control is but one pernicious expression of the capitalism with which the workers can call no lasting truce, save on the day of its abolition?

If the success with which the union has been able to embrace mine-workers in its ranks were a special cause of combativeness, we would expect a similar trait in every other highly unionised industry. But in Australia combativeness is neither necessarily associated with the large union taking in almost the entirety of wage-earners in its special calling or callings,[1] nor dissociated from the smaller organisation with membership less completely representative of the workers of its craft. And if unionism in itself were provocative of industrial disputes, we might expect to find much less trouble in coal mining areas when the union is either weak or non-existent. Yet examination of the records of "strikes, suspensions and lock-outs" of the United States industry does not entirely bear out this conclusion; for, although the important non-unionised coal State of Alabama and the much less important coal States of Colorado, New Mexico, Utah, Virginia, and part of West Virginia, in which unionism is weak or absent, appear to be almost completely free from recorded stoppages, both Kentucky and Maryland, where non-union mines predominate, show records of disturbances at least comparable to those of the strongly unionised States of Illinois, Indiana, Ohio, and Pennsylvania.[2] The presence or absence of unionism may condition the scope or conduct of disputes, but is not essentially their cause.

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[1] The Australian Workers' Union may again be cited.

Nor can proclivity to disputes be attributed to the various *means* by which an orderly structure of wages and working conditions has been sought for the industry. It would scarcely be necessary to affirm this but for the prevalent belief in Australia that the system of compulsory arbitration, not merely in the special expression which it takes in coal mining, but in its general form for all Australian industries, is itself creative of the will to fight. The doctrinaire view that private ownership and management of coal mines must in the nature of things produce endemic hostility on the part of employees represents on the other hand a half-truth supported by world-wide evidence; but it is vitiated by so many important exceptions, both in relations of long-standing satisfaction between private employers and employees and in the instability of mutual relations where workers' ownership and management have been tried, as to throw grave doubts on the doctrine of an inherent viciousness in capitalism, necessarily productive of combativeness.

II. The Psychology of Mining.

The root causes of the never-ending stoppages in coal mining, we believe, lie in the nature of mining itself and of its environmental influences upon the mine-workers. A colliery is like a magnified ant-bed in the making, with pairs of workers toiling in isolation from one another at separate working faces, and with others, each on his own particular bit of road, collecting and forwarding the spoil for withdrawal to the surface. The unit of team work is the pair rather than the group. The minds of the miner and his mate have of necessity to be exercised jointly with the ways and means whereby the coal may be brought down from the face with a minimum of unnecessary effort and a maximum of safety, and, where the coal is not all "clean," with the selection of good coal and the rejection of "dirt." But such mental activity of a mentally active class of craftsmen by no means represents the full exercise of thought. The miners become ruminative by habit. Their work is not monotonous as monotony is understood in other callings, but, as in few other occupations, it does leave them to the "undistracted contemplation of the contrast between the wealth won and the wage paid."[3]

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[2] See "Coal in 1925" (U.S. Bureau of Mines), p. 439, and "What the Coal Commission Found" (by the Staff of the U.S. Coal Commission), p. 205. Unionism is not maintaining its strength in the American coal industry. "Production in the non-union fields since 1918 has increased, while that of the union fields has decreased. It is estimated that in 1920 about 60 per cent. of the bituminous coal was mined by union labour and 40 per cent. by unorganised labour. During 1925 this situation was reversed." A. E. Suffern: "The Coal Miners' Struggle for Industrial Status."

Away from the mine, rather than within it, the mine-workers live their group lives. If their houses are not clustered by the pit-head, as in the smaller mining localities, they are normally to be found in contiguous blocks in the larger mining towns. Mine-workers consequently develop both a strong locality and a strong craft consciousness. Mining communities live in relative isolation, even in big towns where the non-mining population is by no means insignificant.[4] This in itself tends to strengthen exclusiveness and self-consciousness, from which touchiness and combativeness are readily provoked. Such proclivities easily express themselves in the mass meeting or in the lodge. The individual mine-worker, indeed, is never free from the dominance of mass ideas and mass feeling. These contribute an unconscious bias to his judgments, so that whatever individuality he does express is limited to the range set by the collective over-

[3] From the author's "A Study in Social Economics: The Hunter River Valley," p. 75.

[4] E.g., Cessnock, Kurri Kurri, Bulli, Wonthaggi, etc.

mind. This is a key to the understanding of much of the behaviour which is a perpetual enigma to those unfamiliar with mining.

The mine-workers, furthermore, live in a world of craft traditions. They inherit craft practices little changed by those revolutions in technique which have modified working conditions so completely in manufacturing. Changes there have been, it is true, but they have done little to alter the essentially traditional ways of coal mining.[5] Certainly in Australia little has been done to modify long-standing practices of British mining. In Australia, too, the traditional British relationship of the miner to his employer in the mode of payment for the work done has persisted and will probably long persist, despite the attitude of hostility to its continuance officially taken in recent years by the Miners' Federation. The "contract system" whereby pairs of miners undertake to hew coal at a tonnage rate, is really a curious survival of the "letting-out" practices associated with the domestic system of the 18th century. Its peculiar adaptability to coal mining has given it a survival value not vouchsafed to flat-rate payments by the day or week, to the butty-system,[6] or to other methods of paying men at the face. It has given to the miner an independence in relations with his employer equalled, in Australia at any rate, only by that enjoyed by the shearer. To the independence of the shearer a mobile life has added an outlook reflecting some of the expansiveness of the plains. The very immobility of the miner, however, and the circumscribed environment of his working place, have served to infuse his independence with suspicion, a certain narrowness of outlook, and not a little incalculability.

The contract system has, further, in itself made for conditions giving occasion for many petty disputes. It involves not only collective bargaining for basic and differential rates by districts or fields, but also smaller group and individual bargaining as to what rates apply to particular conditions and as to what additional "consideration money" should be fairly claimed. The practice of "higgling" thus tends to focus attention on "the contrast between the wealth won and the wage paid," to breed chronic differences between management and men, and to put a premium on combativeness.

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[5] See Section I., Chapter III.

[6] The system by which an individual contracts with the mine owner to hew the coal at a tonnage rate, but himself employs a number of hewers, either on a tonnage or a day wage basis. Where practised in the Australian coal industry it has been confined to the "dead-work" of cutting away rock, and has had little vogue.

All this is not to be construed as condemnation of the mine-workers. Those who have lived among them and have understood them know them for a people of many rugged but admirable qualities of open-heartedness, loyalty and heroism.[7] In all essential respects they differ no whit from their fellow-citizens of other callings. But they do exhibit both the virtues and limitations of a peculiar physical and social environment.

It requires, however, at least two to enter upon a disputation or to produce a disagreement. In the great majority of disputes in the coal industry the coal owners as such are not implicated directly and personally, but indirectly through the mine managers by whom they are represented. The owner-investors seldom live amongst the coal-winners. As the author has elsewhere had occasion to write,[8] they cannot as a class, any more than investors generally, be regarded as economic oppressors; but, because their investment is in coal mining, they are assumed to have inherited the guilt of forerunners back as far as the bad old days of women and child labour in the mines, and that is a guilt from which the traditions of the miners are in no hurry to grant employers in coal mining an entire absolution. This never-ceasing imputation of guilt is naturally enough resented by the present-day owner-investor, who may be sincerely anxious to meet his social responsibilities decently and squarely. He in turn tends, if he cannot keep his good humour, to develop an habitual hostility to the mine-workers' claims to improved conditions of work and remuneration, which are regarded as an expression of incurable "selfishness." This is the owners' psychological defence reaction. With many owners who are in constant contact with their employees, hostility is replaced by philosophical resignation to a life of incompatibility; with a few the reaction leads to an attitude to their men which is uncompromising and embittered.

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[7] The author speaks from the experience of five years lived in the Hunter River Valley.

[8] "A Study in Social Economics: The Hunter River Valley," p. 76.

The perennial disputes arise, then, from a conflict of mental attitudes. The miners, as a whole, are probably no more selfish than the owners—or than most men everywhere; nor can a general indictment be sustained against the owners as ogres of oppression. What is needed to give these attitudes something like a common polarity is first a great flood of light upon the real motives, hopes and fears which impel each side, in the face of its economic difficulties, to action inimical to the other; so that there may follow a recognition of really common bonds and a new patience for the rational ordering of rights and responsibilities in the industry.

III. WORK AND WAGES IN THE INDUSTRY.

It is proposed in this Section to examine the nature of the disputes which lead to so many dislocations in Australian coal mining. But it will be first necessary to discuss briefly the main features of the wage structure and the working conditions around which it is built.

Several types of mine-worker—miners, shooters and fillers, machinemen and wheelers—receive payment for their work on a tonnage basis. A small minority of wheelers and machinemen on certain seams, it is true, are paid solely by the day. The great majority of wheelers, moreover, are on a minimum daily rate, irrespective of earnings they make on the tonnage rate they receive. Thus in the Newcastle area of the Northern district of New South Wales the average hewing rate for miners working the Borehole on what is known as the "shandy" or "consolidated" basis,[9] is 5s. 0½d. a ton, but varies above or below this price for other seams in accordance with the method of working or by the degree to which small coal is found by experience to represent, in different collieries, a ratio to the large coal won. Thus in the West Wallsend area the rate is 5s. 7d. and for the Victoria Tunnel seam in the Newcastle area, 4s. 9¾d.

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[9] I.e., payment for all coal, both "large" ("rounds") and "small," weighed in the gross.

In the rare instances in which miners are paid on the "separation" basis, the district rate is 6s. 11d.[10] a ton for large coal and 7·6d. for small. The rates also vary in respect of coal won from the "tops" and "bottoms" of certain seams and of coal won from pillars. Tonnage rates generally in the Southern and Western districts are smaller than those of the Northern for the same general reasons that determine a low rather than a high rate at any particular mine in the North. For coal won by machinemen the rate per ton may range between one-eighth and one-quarter of rates for work done by the pick.

The tonnage rate provides the contract worker, except the wheeler on his guaranteed daily rate of from 18s. 3d.[11] to 19s. 2d.,[12] with the main basis of his earnings. But the multiplicity of differences of earning capacity which different places in a mine or different mines themselves offer to the miner has long established the practice of special additional rates calculated to ensure a rough equality in opportunity for earnings. There is first of all what is known as yard work, for which yard money additional to the tonnage rate is paid. Thus, when the miner is called upon to drive a heading or cross-cut against the grain of the coal, he is paid a standard rate of 12s. 2d. per yard advanced in the heading and, say, 13s. 2d. for the cross-cut. Yardage rates are also paid for narrow places working bordways, the rate increasing with the narrowness of the bord, for the opening up of bords, and for what is known as "siding over"—a process of cutting across the grain in the extraction of pillars.

Yard money is the most important supplement to basic earnings. There are, however, a number of other

[10] In an exceptional case the rate would be 7s. 6d.
[11] Northern District.
[12] Western District.

differential payments. For "jumps," or the crossing of faults, which involves putting the floor at a higher or lower level, an additional rate of, say, 2·4d. per inch vertically for each yard advanced is payable to the miner. For working in wet places he receives 1s. 6½d. a day. Should the seam for any reason contract below a minimum height, varying from 4 feet 6 inches to 5 feet[13] on the Newcastle field, or below 5 feet on the Maitland,[14] an additional 1½d. per ton per inch is payable as compensation for the handicap which such contraction may represent. A "dirt scale" provides similar compensation for the hindrance to hewing caused by bands of shale or other material in the seam. The payment is a variable amount, dependent on the amount of dirt present. Four inches of band must be thrown away without compensation, but anything above four inches carries 1d. or 1½d. per inch on the tonnage rate, variations being made on a graduated scale in accordance with the thickness of the seam. For double-shift places, as when headings are being opened up or circumstances demand unbroken operation by successive shifts of men not sharing mutually the proceeds of their joint work, 4·66d. per ton is added to the tonnage rate. If called upon to erect slabs for the support of the roof the miner in a typical Maitland colliery is given an additional rate, varying up to 1s. 0½d. per slab, with an increase of 1½d. for every additional foot, and, should the roof itself be bad, he can, by mutual arrangement with the management, expect further "consideration" money. On the debit side, however, must be put the cost of explosives, which the miner must himself buy, and which appears to amount on the average to about 10 per cent. of the gross earnings by miners in New South Wales.

The wheeler, too, may claim a variety of "consideration" payments. On top of his basic daily wage of, say, 18s. 3d., and his yardage rate up to 6d. for a prescribed distance of wheeling, he may, where the distance is exceeded, receive a slight additional rate, and special allowances for wheeling only one skip at a time, for using two horses, for the hindrance caused by a horse's loss of a shoe, for wheeling bricks, rails and timber above a certain length, for opening and shutting doors, and for breaking sets.[15] Each day's wage, moreover, has to stand on its own, the rate remaining unaffected by changes in the number of miners served by the wheeler from day to day.

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[13] First determined in the famous 1895 Agreement between associated owners in the Newcastle District, the old Miners' Association of the Hunter River District, and delegates from individual collieries, which provided a code upon which rates generally have been subsequently built.

[14] On the Maitland field a maximum height of 9 feet is an additional limit.

It is to be seen, therefore, that the primary tonnage rates for the group of contract occupations in the industry are in themselves no necessarily accurate gauge of actual daily earnings.[16] The growth of the "frill" payments, as they are known, to-day serves not only their original purpose of helping to equalise opportunities for daily earnings, but of supplementing those based directly on the primary rates. The practice of three-monthly "cavilling" for places,[17] which is a much older idea than "consideration" payments in coal mining, is intended to ensure rough and ready justice in equalising yearly earnings in a mine. It is clearly justified in the existing wage structure of the industry on grounds of fairness to the miners, though it does frequently frustrate the management's effective use of the best qualified workers on the most difficult places.

Miscellaneous "off-hand" labour underground and work done by men on the surface is paid for on a daily rate basis which, for adult workers, does not fall below 18s. Shot-firers and deputies are a group by themselves, the former's daily rate ranging between 21s. 7d. and 22s. 1d. The supervisory work of deputies may be paid for at a generally higher daily rate of from 22s. 8d. to 24s. 4d., or, as in the Western district, at a weekly wage of £7. Underground overmen in the Southern district are also weekly-wage earners of from £6 15s. to £8 10s., whilst colliery staff officials, such as mine managers, under-managers, engineers and electricians, and office staffs, are paid on a salary basis. "Off-hand" labour underground comprises the work of shiftmen (1st and 2nd class), whose duties are of a miscellaneous character, roadmen (1st and 2nd class) for laying main roads or keeping them in repair, main-road drivers, onsetters and their assistants, who (in shaft mines) put the skips into the "cage," clipper and flatter boys, who make up sets of skips, jigger boys, who (in steep seam mines) control the gravitational running of full and empty skips between bord levels and roads, lamp-men, winch-drivers, and others for special tasks. The "top-hands" include banksmen and their assistants (in shaft mines) to take skips from the "cage," bankers-off to put skips into the tipplers, an engine-driver and firemen for the winding gear, a screen overseer and screenmen to separate the screenings from the large coal, belt-hands to clean out dirt from the coal on the slowly-moving belt-conveyor, a weighman employed by the colliery proprietor, and a checkweighman employed by the miners, waggon-packers, trimmers, waggon-shifters and waggon-shunters, a ganger and fettlers for the rail tracks, a cable-hanger, electrical fitters and mechanics, engineers, smiths, blacksmiths and their strikers, engineering fitters, planers, slotters, borers, millers, shapers, drillers, a pick-sharpener and horse-shoer, a horse-keeper, saddlers, carpenters, sawyers, skip-repairers, hopper-repairers, bricklayers, painters, a store-man, labourers, carters, down to a messenger.

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[15] Uncoupling trains of skips.

[16] An extreme instance is found in the case of a wheeler on the Maitland field, who drew for a fortnight's work £10 in wage, plus £16 in "consideration" money.

[17] The drawing of lots for the re-allotting of working places among the pairs of miners in a colliery.

Not every element in this formidable catalogue of labour is, of course, to be found in every mine, but few collieries (excluding the "pot-hole" pits) can dispense with more than half of the occupational tasks enumerated. Taking the coal industry of New South Wales as a whole, with its total of employees ranging between 21,500 and 24,000, somewhat more than half the number employed are men or boys[18] on daily wage rates. Evidence points to an increase in recent years in their numbers in relation to those of contract workers.[19]

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[18] Under 21 years of age whose daily rates range from 6s. 2d. at 14 to 16s. 2d. at 20. Wheelers under 18, wheeling from the face, get from 15s. 7d. to 16s. 4d., plus "consideration."

If now we turn to the disputes of the industry, we shall be the better able to understand the significance of the immediate causes giving rise to them. It is first desirable to distinguish between those of a major order occasionally involving either the whole industry or an entire district from the minor local stoppages whose name is legion. The former may arise over some question of principle or of a common rule for the industry, for the enforcement of which the whole organised strength of the mine-workers' organisations will be mobilised; the latter out of differences between management and men in particular mines in the interpretation of awards or of customary rights, or in the thousand and one possible occasions for disagreement between them in that "uncertain frontier where the authority of the one and the independence of the other strive to be dominant."[20]

Examination of the recorded causes of dislocation through disputes in coal mining in the Northern district of New South Wales from 1914 to 1924[21] throws instructive light on the nature of the immediate issues provoking dissidence. As the first half of the period was a time of much unrest among the mine-workers and the second half relatively quiescent, the years covered provide a fair sampling of the experience of the industry. It is notable, first, that dislocations of a major order, in terms of working days lost, occurred in respect of wages, hours, the conditions of employment of certain men, and of active sympathy of mine-workers with other militant unions. The total number of days lost in the period was 4,174,000. The greatest aggregate of losses in the categories of causes is recorded as due to disputes in respect of working time, mainly on account of opposition to the afternoon shift and of the demand for eight hours bank to bank. Disputes on hours questions meant the loss of 1,339,000 days; those on account of wage issues, mostly for increase and readjustments in rates, of 804,000. Those on account of employment conditions, the most important being due to protests against dismissals, caused the loss of 555,000 days. About the same number were imputed to sympathy[22] strikes, 522,000 to protests against working conditions, 120,000 to questions of union jurisdiction and discipline, and some 178,000 to stoppages due to prosecutions, stop-work meetings and other miscellaneous causes of work dislocation. Thus one-third of the time lost through disputes was associated with the length or nature of the working day, one-fifth with wages, one-eighth with conditions of employment, one-eighth with working conditions, one-eighth with union solidarity, and about one-tenth with other causes.

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[19] For the implication in this fact, see Table V., Section II., Chapter III.

[20] "A Study in Social Economics: The Hunter River Valley."

[21] As published in the "N.S.W. Industrial Gazette," 28th February, 1925. Details for the Western and Southern districts are given in the same excellent publication, and, except for proportionate figures of aggregate working days lost through various causes, are comparable with those of the North.

Still closer examination shows a multiplicity of variants within the broader classes of cause. Thus with losses associated with the working day are to be found those due to managements closing down mines as a protest against time lost through sectional disputes themselves, protests of the miners against broken time, against any work on "back" Saturdays, and disagreements as to starting or ceasing time. Those associated with wages may include losses due to objections to award rates, to protests against deductions and increased cost of explosives, to insistence on payment for time lost, for special or standard rates, or for deficient and wet places, and to disagreements as to the payment of a full day's pay for short shifts. Apart from the hold-ups over dismissals, employment disputes may be concerned with the employment of certain officials or workers, including non-unionists, or with questions of preference, promotion and reinstatement. Working conditions are notably productive of disagreement between management and men, and between the men themselves, leading to upset in the domestic life of the colliery. The management may refuse to co-operate with the "darg" system, the miners for their part declining to work because of unsatisfactory distribution of skips, supply of materials, condition of roads or machinery, fitness of horses, or safety of the mine. Disagreements between the two parties are frequent over what is a deficient, special or wet place and over conditions governing the use of explosives. Hold-ups may occur because men are dissatisfied with the result of a cavil, or because they either want or are opposed to a change of work.

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[22] Notably in connection with the great railway strike of 1917.

Amongst the great number of miscellaneous reasons for stoppages are to be classed the refusal of "good" unionists to work with the "bad" who decline to pay strike levies or union dues, or with members of other unions, or with non-unionists; although it is equally true that mine hold-ups have occurred because men have objected to fines imposed by their union. Prosecutions of individuals will on occasion arouse the sympathy of others, and a stoppage occurs. Stop-work meetings do not, of course, necessarily result from disagreements with the management, but are held without any special reference to managerial convenience. A hold-up of work may occur as a protest against delay in hearing claims, may be a method of retaliation against "victimisation," or may be for no more serious purpose, as soberly noted in official records, than to enable the workers "to view an aeroplane."[23]

IV. THE MACHINERY OF ARBITRATION.

When mine-workers and mine-owners or their managements fall out there are three main ways by which the issues may be settled. These are the methods of "exhaustive strife,"[24] replacement of employees, and arbitration. Exhaustive strife implies either defeat of one of the parties or the calling of a truce between them without the aid of outside intervention. Replacement of employees is a euphemism for the employment of free or "blackleg" labour. Arbitration means the mediation of a third party either of unofficial standing or having statutory powers of intervention.

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[23] "N.S.W. Industrial Gazette," 23rd February, 1925, p. 483.
[24] An official phrase used by the N.S.W. Department of Labour and Industry.

In one sense the use of the term "exhaustive strife" suggests over-statement; for, although not a few pre-planned struggles have been long, exacting and bitter for both sides, the great majority of sectional stoppages have been precipitate, brief,[25] at worst irritating if costly, and readily terminable by direct negotiations between the two parties. By far the greater number of dislocations in coal mining in Australia, measured either by the actual number of individual stoppages or by the days lost, are settled by direct negotiation.[26] This, incidentally, is true of disputes between employers and employees generally in the Commonwealth.[27] There is no known case on record where strike-breaking by means of free labour has ended a dispute in the coal mining industry, though such a method was tried in troublesome days of the war period. The peculiar skill of the mine-worker is an extraordinarily strong defence against displacement by ordinary unskilled labour, a fact attested by the inability of the owners to run their mines at all if the mine-workers, or any small part of them, desert.

The wastes of time and money, both to employers and employees, the losses, vexations and disruptions of business suffered by the multitude of coal purchasers within Australia and without, and the general futility of so many of the dislocations in mining, even when eventually adjusted by way of direct negotiation, have inevitably led to many efforts to establish a satisfactory system of official arbitration. Indeed, the coal industry has figured prominently in the whole history of industrial arbitration in Australia. This prominence was no less during the period of trial of State-established voluntary conciliation machinery in the 'nineties and after the

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25. Many lasting only one day.

26. Thus in 1924, to take a typical year, of the 482 dislocations involving a loss of 516,000 days in the industry in N.S.W., 422, representing 379,000 working days lost, were settled by direct negotiation, 51, representing 37,000 days, by "other" methods not officially explained, and nine, representing 99,000 days, by arbitration.—"N.S.W. Industrial Gazette," p. 490.

27. The proportion so settled ranged between 47 per cent. of the total in all industries in 1924 and 76 per cent. in 1921.—"Commonwealth Year Book, 1927," p. 548.

adoption by New South Wales and other States of systems of judicial compulsory conciliation and arbitration[28] than it has been since the industry came first under the jurisdiction of a permanent Commonwealth tribunal in 1920.

Strikes of major magnitude have occurred in the industry from time to time from as early as 1851. At least two of these, namely, those of 1873 and 1885, successfully established better working-time standards for the miners by reducing the working day from 10½ to 10 hours, and then to eight hours. The famous Lambton Strike of 1885, which won the 8-hour day, was one of the most dramatic episodes in the history of the industry. The 'nineties were a period of steady prosperity relatively undisturbed by big industrial troubles, but the decline in earnings during the early years of the present century was responsible for an accumulating restlessness among the mine workers, which culminated in one of the most bitter of all the struggles which have marked industrial life in the Commonwealth. The miners were sorely beaten in their efforts in the great strike from November, 1909, to March, 1910, to force improvements in the hewing rate. The failure of voluntary conciliation machinery on that occasion led the Liberal Government of the day in New South Wales to push through legislation inflicting heavy penalties for strikes and lock-outs.[28a] Although subsequently amended and improved by successive Labour and Liberal Governments, the machinery of compulsory conciliation and arbitration failed, however, to prevent two further upheavals on a big scale before the war,[29] and, with the transfer of mining disputes to the Commonwealth Arbitration Court, also failed to prevent the miners in 1916 from forcing, by the direct action of a big strike, claims filed in the Court and from engaging actively in the great railway strike of 1917.

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[28] First in South Australia in 1894. New South Wales first set up its Compulsory Arbitration Court in 1901, changed over to a Wages Board system in 1908, adopted a mixed system of Courts and Boards in 1912 (supplemented by a Board of Trade for the annual declaration of a basic wage for the whole State), and, more recently, in 1926 and 1928, abolished all this machinery in favour of Industrial Commissioners exercising the functions of a Court with compulsory powers and the duty of fixing the basic wage for the State as a whole. (For an excellent account of the "Development of Wage Fixation in Australia," see article by G. V. Portus in "The American Economic Review," March, 1929.)

[28a] The legislation rushed through to make strikes and lock-outs illegal was responsible for the most dramatic elements in and the failure of the strike, and shortly afterwards for the accession to power for the first time of the State Labour Party.

[29] In 1911 and 1913.

The strike of November, 1916, following compulsory conferences convened by the Prime Minister, led to the direct intervention of the Commonwealth Government in the affairs of the coal industry. Exercising his powers under the War Precautions Act, the Prime Minister[30] set up a tribunal or board[31] with authority to fix work and hours conditions of miners[32] in the industry, and also the selling price of coal. It was this Tribunal which fixed hours at eight bank to bank, and in a succession of Orders established the series of contract and wage rate improvements up to 1919, as well as the rises in the declared selling prices of coal, referred to later in Chapter IX. In passing, it should be mentioned that one of these Orders (No. 3, of 20th December, 1916) abolished the hitherto existing sliding scale of payment of rates of wages in accordance with the movements up or down in the price of coal. Still more direct intervention of Commonwealth authority was to come in 1919 and 1920. Demands by the Miners' Federation towards the end of 1918 for wage increases of 25 per cent., together with certain altered conditions, for all its members produced a number of abortive conferences and eventually a dramatic re-entry of the Federal Government. Under the War Precautions (Coal) Regulations, the Acting Prime Minister[33] issued orders concurrently acquiring by the Commonwealth all coal won in New South Wales, raising the rates of miners and other contract workers by 15 per cent., of adult day wage off-hand employees by 2s. 7d. and of boys and youth by 20 per cent., and raising the price of coal by amounts ranging between 2s. 3d. and 2s. 9d.

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[30] Rt. Hon. W. M. Hughes.

[31] Consisting of Mr. Justice Edmunds, of the N.S.W. Industrial Arbitration Court, who was assisted by three assessors representing the employers and three representing the men.

[32] Conditions governing wage rates of mechanics and other craft occupations associated with the mines remained under the jurisdiction of the N.S.W. Court.

[33] Rt. Hon. W. A. Watt.

The final step in the evolution of the special machinery of arbitration in coal mining was taken in 1920. Early in the year the restlessness of the miners expressed itself, among other ways, in the demand for a six-hour day, a shorter working week, and the abolition of the contract system. The proprietors disclaiming any power to alter existing conditions, the Miners' Federation invoked the intervention once more of the Prime Minister, who again convened compulsory conferences. The upshot was the Commonwealth Government's introduction of the Industrial Peace Acts of 1920, under which a tribunal, independent of the Commonwealth Industrial Court of Conciliation and Arbitration, could be set up, with jurisdiction similar to and even greater than that of the Federal Court, in any industry whatsoever with ramifications in more than one State.

The intent of these Statutes, despite their implied challenge to the jurisdiction of the Federal Court,[34] was clearly to meet the situation in the coal industry,[35] and, as a matter of fact, they have never been used to establish independent tribunals in any other industry except coke manufacture. Four tribunals alone have operated, dealing respectively with (1) miners and their associates, (ii.) engine-drivers and firemen in the coal industry, (iii.) engineers in the coal industry, and (iv.) workers in the coke industry. The most important of these is that dealing with the miners, which is the one usually referred to as the Hibble Coal Tribunal.[36] This, for instance, is composed of six representatives of the employers, six representatives of the employees, and a permanent independent chairman appointed by the Governor-General-in-Council. The Tribunal deals with general claims throughout the Commonwealth, but can only be brought together if both parties agree as to the existence of a dispute. Though constitutionally only operative in an Interstate dispute, the Tribunal has acted effectively from time to time in troubles within a single State. The Chairman in practice is virtually the arbitrator, and exercises all the powers, and even more, of an arbitration judge, since at least three judges of the Commonwealth Industrial Arbitration Court are necessary in other Interstate industries than coal to make variations in working hours, whereas the Chairman of the Tribunal alone may exercise such power.

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[34] The President of the Court, the late Mr. Justice Higgins, interpreted them as a challenge and resigned as a protest.

[35] Clearly, also, to placate the miners who showed great impatience at the delays in hearing their claims before the Commonwealth Court.

[36] The Chairman of all four Tribunals is Mr. Charles Hibble.

The many intricacies in the contract system of wage payment in coal mining themselves offer partial justification for the existence of a special Arbitration tribunal capable of giving them undivided attention. But one result of such independence in practice is the setting up of standards for the coal industry having no necessary relation to those governing conditions in industries over which the Federal or State Arbitration Courts have jurisdiction. A brief comparative survey of what principles have become established by both Tribunal and Courts in respect of similar features in wage determinations for the coal mining and other industries will therefore have value in so far as it throws any light on such divergences.

For an understanding of the body of principles underlying industrial court arbitration in Australia there exists a considerable body of official records[37] and a small but growing body of publications by experts in a private capacity.[38] For an understanding of the principles guiding the Coal Tribunal there is no comparable material. There is no summing-up of evidence by the Chairman, as the term is ordinarily understood in a court, and consequently no official records of argument which may be analysed. After a case is heard the parties consider their award *in camera*. If they agree, an award is framed there and then and gazetted,[39] purely as an award without comment. If they disagree, which is more often the case than not, then the opinion of the Chairman prevails, and he makes the award. Unless there happens to be some peculiarity to be explained or some special principle involved, this also goes without comment. The investigator who wishes to understand the workings of the Tribunal must therefore rely for his knowledge upon independent and circumstantial enquiry.

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[37] Such as the Commonwealth Arbitration Reports and the official industrial records of the various States.

[38] Such as the late Mr. Justice Higgins' "A New Province for Law and Order" (1922) and Mr. George Anderson's "Fixation of Wages in Australia" (1929).

[39] In the "Commonwealth Gazette."

For all industries in Australia for which determinations in respect of wages and working conditions are made by the Commonwealth or State Industrial Courts, or by State Wages Boards,[40] the principle of a basic wage related to the prevailing cost of living for the lowest paid type of worker is a fundamental standard. In the Commonwealth Court "cost of living" has always had reference to the minimum needs of a man, his wife and three children living in a state of "frugal comfort," as first determined empirically by the late Mr. Justice Higgins in his famous "Harvester Judgment" of 1907, and subsequently adjusted to variations in living costs measured by the indexes of the Commonwealth Statistician. The various State Courts and Wages Boards, including the State Court in New South Wales until its replacement by an Industrial Commission in April, 1926, have similarly adopted, either specifically or tacitly, an average family of four or five as the limit for the interpretation of "living" needs. The Industrial Commission of New South Wales is to-day the one exception, in that its declarations of a basic wage, consequent on the introduction of the scheme of Family Endowment in that State, are for a man and wife only.[41] In view, then, of the adjustment in Australia by industrial tribunals generally of basic wage rates to living needs, it becomes of interest to ask what is the practice of the Coal Tribunal in the determination of the basic rates of mine-workers.

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[40] As in Victoria and Tasmania, which have no State Industrial Court.

[41] It is to be noted, however, that the declaration of the living wage for men, given on 27th June, 1927, although based on the needs of two adults, was at the same rate as the previous declaration in December, 1926, based on the needs of two adults and two children, with an addition to cover increases in prices between the two dates.

As far as can readily be ascertained, the Tribunal, although a Commonwealth instrument, does not give its judgments with any reference to the "Harvester Judgment" basis or to the cost-of-living adjustments which have been made thereon. Wage standards for mine workers are determined solely by the conditions in the coal industry itself and by the customary levels which can be traced to the Agreement made between Associated proprietors and the old Hunter River Miners' Association in 1893. Basic rates have therefore no necessary relation to the living standards of a mine-worker's family.[42]

The Tribunal started on bases already existing in the industry in 1920, which were then, and, indeed, have always been, on a somewhat higher level than those for the lowest-paid workers in other industries. This is in part due to the recognised fact of intermittency in mining operations, in part to the customary practice of paying tonnage rates for so many of the workers, and in part to the strong collective bargaining power of the main mine-workers' organisation. Obviously when times are relatively good for the coal industry this independence from prevailing standards in other industries operates to the mine-workers' advantage. But for many of them in times of severe depression and widespread underemployment it can give no guarantee of earnings even up to the standard of the basic wage obtainable by men in work elsewhere. This serves to explain the present reaction against the contract system in favour of a minimum weekly wage for all workers in the mines.

The Coal Tribunal seeks as far as possible to make standards uniform for the whole industry and, where this is not possible, for particular districts or fields. Thus it has been possible to make the basic rate for some classes of day-wage labour uniform in all districts, while for other classes, though varying greatly from the general standard, it is uniform only within a particular district. Basic hewing rates, however, have even much greater variety in accordance with the physical conditions of seams in particular localities.

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[42] Even though evidence is frequently brought before the Tribunal by the workers' representatives to show that current rates are not adequate for the needs of a man, wife and three children. It is interesting in this connection to note the evidence of Mr. W. Thomas, Secretary of the Queensland Colliery Proprietors' Council, before the Federal Royal Commission on Child Endowment, on 4th November, 1927. Pointing to the fact that in its awards for the Queensland coal industry the Coal Tribunal had perpetuated award conditions fixed by the Queensland Court of Industrial Arbitration on 5th October, 1921, and that the Act under which that Court operated required basic rates to be related to the needs of two adults and three children, Mr. Thomas stated: "I think I am quite justified in assuming that the wage paid throughout Australia in the coal-mining industry is based on the unit of a man, his wife and three children."

This leads to a consideration of wage differentials generally and to the respective attitudes of Commonwealth Arbitration Court Judges and the Coal Tribunal to the question of work which is specially laborious, disagreeable or dangerous. Generally speaking, the Arbitration Court Judges have been averse, when fixing a minimum wage for a certain class of work, to taking into consideration whether the work was "wholesome or unwholesome, dangerous or safe, heavy or light, pleasant or unpleasant."[43] Certain exceptions have been made, it is true, but the view has been taken that wage differentials in respect of special conditions affecting a particular class of work should not appear in basic rates.[44]

The Coal Tribunal, inheriting a situation built up by long-standing customary practices in the coal industry, would not have been free to take the same view without introducing foreign elements into a wage structure peculiarly suited to the conditions of mining. True, in respect of differential payments for work that is dangerous, the Tribunal's view has been substantially that of the late Mr. Justice Higgins, who stated in connection with another industry that "the risks involved may, of

43. Anderson: "Fixation of Wages in Australia," p. 355. This was the oft-repeated opinion of the late Mr. Justice Higgins, although both he and Mr. Justice Powers have on occasion added extra payments to the minimum when employees in certain industries have had to work in "wet" places. Deputy President Sir John Quick and Mr. Justice Powers have also granted small additions to the basic minimum for work done in "dirty" places.

44. Thus (i.) in respect of disagreeable work: "My view is that the minimum rate of wages ought not to be made to depend upon the degree of dirtiness of the work. The man must accept the conditions of the work to which he has devoted himself." (Higgins, J., 10 C.A.R 155, pp. 196-7.) (ii.) In respect of work prejudicial to health: The remedy for conditions of work injurious to health is "a shortening of the working week, and not an increase in wages." (Higgins, J., 10 C.A.R. 155, p. 187.) (iii.) In respect of dangerous work: "The Court will not prescribe extra wages to compensate for unnecessary risks to life or health of the employee." (Mr. Justice Higgins in his book, "A New Province for Law and Order," p. 10.) These opinions are cited by Mr. G. Anderson in Chapter X. of his "Fixation of Wages in Australia."

course, enter into a *bargain* for rates, but they are not matters to be considered in fixing *minimum* rates, nor is it well in the interests of the community that employers should be encouraged to think that the Court sanctions the putting of human life in danger if certain extra rates be paid."[45] Basic rates generally in mining allow for the dangerous nature of the industry, and only in rare instances have special consideration rates been fixed for excessively dangerous places.

Even the basic hewing rates, however, are differentiated at least in part in accordance with the laboriousness involved in working a seam. But the question of discomfort is almost entirely subordinated to the miner's concern as to the likelihood of any particular working place affecting his capacity to make maximum earnings. This same concern has resulted over the years in the building up of the set of differential standard rates for different forms of "consideration" which have come to be inseparably linked with the basic hewing rates. The Coal Tribunal has therefore been at least as concerned in its awards with standards for differentials as with standards in the major rates upon which the mine-worker's earnings depend. Practically all the differential rates described earlier in Section III., with the exception perhaps of that for "water money," are to be regarded as consideration in respect of special laboriousness in the work.[46] "Water money" is consideration partly for disagreeable and partly for health-endangering conditions of work.

The work of the Coal Tribunals has not received the continued and unbroken benison of the parties to them. The disposition to resort to defiance of the awards has been unmistakable, not only by the mine-workers but also, as the most recent happenings have shown, by the proprietors. The Tribunals, like the Arbitration Courts, have made awards under which the workers have at first refused to carry on, and then unwillingly accepted.[47] The owners complain of the Tribunals because of alleged maintenance of uneconomically high wage rates and over-generous conditions for the workers, the workers because of alleged inadequacy of the machinery provided for the settlement of their claims.[48] From all this it might be inferred that the Tribunals, like the machinery which preceded them, have been marked by failure. But such a judgment would neglect to take into account the many occasions on which their conciliatory offices have been effective in settling troubles which might have developed into serious situations, or to recognise the relative freedom from major upheavals in the industry since their inception in 1920. Compulsory arbitration as a procedure for resolving industrial dissidence is still on its trial in Australia, and whatever inefficacy there may be in the idea itself is not justly to be attributed to the system with which it has been at least reasonably clothed for the peculiar needs of the coal industry.

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[45] In Gas Employees' Case, 1919, 13 C.A.R. 437, p. 465 (quoted by Anderson, ibid, pp. 285-6).

[46] The "dirt scale" in coal mining, it should be noted, has no resemblance to "dirt money" paid in certain other industries. The former has reference to dirt to be removed from the product of the work, the latter from the person of the worker.

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[47] As, for instance, when the engine-drivers and firemen employed in the coal mines of N.S.W., Victoria, Queensland and Tasmania in 1926 struck for 34 days in N.S.W. and Victoria and for three days in Tasmania (a settlement being made in Queensland without stoppage) because of a reduction by their special Tribunal of wage margins hitherto enjoyed over other crafts associated with the mines.

[48] "If we assume that arbitration is right," says the President of the Northern Branch of the Federation (Mr. Hoare), "there is no necessity for strikes. But the men strike because they cannot be heard. Claims listed by the Federation for years have not yet been heard. There is every incentive for lodges to strike through insufficiency of arbitrators." (Interview with the author, 20th November, 1924.)

CHAPTER IX.

THE GENERAL PROBLEM OF COSTS, PROFITS AND PRICES.

I. THE MEANING OF COSTS.

The "necessary costs of production" for an industry is a phrase apt to gather about itself no little ambiguity as it is commonly used. There are at least two senses in which the qualifying term "necessary" may be understood, and at least two ways in which the word "costs" may be employed.

Costs of production may be "necessary" in the sense that the purchaser of the commodity is under the necessity of paying in price the aggregate of the unit charges which each contributor in the endless chain of services needed to evoke the product is able to exact. Costs of production in this meaning are a sum-total of actual payments, whether involving waste or not. In another sense costs may be "necessary" only in the meaning that the aggregate is a resultant of deliberate exclusion, at points of control in the chain, of elements of unneeded "service" either hitherto but no longer useful, or threatening an unneeded intrusion. In this sense the "necessary costs of production," by excluding wasteful expenditure, are an approximation to an economic ideal.

The word "costs," again, may be used of the aggregate of all the elements except the net profits of the enterpriser. This usage, of course, has its practical value to the business man or accountant. But from the viewpoint of the final purchaser of the commodity, net profit is only one element of cost. That, too, is the completer view of costs taken by the economist.[1]

These ambiguities contribute to the confusion in current argument about the necessary costs of production in the business of coal. Just what are these costs, and in which sense do the disputants speak of them as necessary? It would not, of course, be true to say that the coal proprietor is not concerned with the consumer's, or even the miner's view, that the final selling price at factory or house is the full measure of coal costs. But it is true that he concentrates attention upon elements of expenditure within the mine itself, or of transport to the point of shipment, which, subtracted from the ruling pithead or delivery-at-wharf price of coal, leave his margin of net profit greater or less. To the industrial consumer of Maitland coal in Melbourne, Adelaide or Singapore, however, the mine-owner's costs may be less than half the costs which *he* is called upon to pay in price.

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[1] This, of course, is only an elementary consideration necessary to clear the ground for an understanding of the meaning of the "marginal costs" in current theories of value.

As to whether the elements in either mine owner's or consumer's costs are "necessary," each contributor naturally tends to defend the necessity for his own service in the sum and to question the costs involved in the services of the rest. With his own he uses the first meaning of the term, with others' the second. Consumers of coal generally in Australia, however, have reached a stage of critical irritability which is apt to deny virtue in necessity of the former sort and to concentrate its questionings upon necessity in the second sense.

What are the cost elements in the business of coal? From the inclusive viewpoint of the economist or of the final consumer, they may be placed in five categories—equipment costs, labour costs, overhead costs, transport and marketing costs, and profits. This is not a strict accountancy classification. More particularly, it will transfer certain elements from the accepted grouping of overhead costs to a place beneath the headings of equipment and labour. The classification, however, will be serviceable to the analysis in hand without doing outrage to the canons of good accountancy.

Before proceeding to closer examination of these categories, several general observations may be made about costs of production in the coal-mining industry. The first is to reiterate the fact already stressed that the first stages in colliery operation are relatively more costly, more prolonged, and represent less retrievable expenditure than those of most other industrial undertakings. This adds to the investment risk, as it gives some warrant to high net profits at some periods as an offset to low profits at others. Secondly, as with industries generally, decreased output in coal mining pushes up the unit cost of production, more particularly as a large proportion of such cost is paid for on a non-varying contract-price basis. In the third place, there are much greater variations in the total unit costs of production as between mines, even those adjacent to one another on the same field, than are usual between factories making a similar product. Moreover, while the scale of colliery operations may have a significance for costs, no safe generalisation may be made, at least in Australia, that unit costs diminish as the size of the mine increases.[2] These considerations point to the need of caution in drawing general conclusions from the experiences of particular collieries.

II. EQUIPMENT COSTS.

Equipment costs, broadly interpreted, embrace both general interest charges on borrowed capital invested in standing assets and payments at regularly recurring intervals or as renewal charges on specific items. Thus for a very few colliery enterprises operating on their own freehold land a part of general interest charges may properly be allocable in respect of such investment; for others (the great majority), extracting coal from Crown or private leasehold lands, rents and royalties are among renewal charges to be added to those of general interest. In all collieries general interest charges may represent recurring payments in respect of initial expenditure of capital on shafts, tunnels, haulage, winding, electrical power and other machinery equipment.[3] Other items of equipment cost are irregular in their recurrence but inevitable in their incidence on the total costs bill. Such are the necessary repairs to buildings, plant and railway owned by the mine, the cost of tools replaced and of timber, explosives, oil, water and a multitude of miscellaneous materials called into use. Electric power, either purchased or generated, is, on the other hand, a regularly recurrent equipment requisite, the cost of which has nothing to do with the charges on original investment. As to whether the hire of coal waggons, either from the private collieries or from the State Railways, should be classed as an equipment or a transport cost is debatable, but, for reasons which will be advanced, it is perhaps preferable to relegate them to the latter classification. Provision for general depreciation is obviously, however, a part of equipment costs.

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[2] Apparently, however, this is a generalisation having some truth for coal mining in Great Britain. See Lubin and Everett: "The British Coal Dilemma," p. 275. This has been true also of brown coal winning operations in Victoria.

[3] The formation expenses are not themselves to be classed among current costs. They are not so included in sound accountancy practice.

Estimates based on published figures from official sources show that the average pit-head price of coal from the Northern district of New South Wales has, in the period 1921-1927, ranged between 17s. 7d. and 19s. 2d.[4] per ton. This is, of course, an inclusive measure of all mine costs, including gross profits. Of this total the sum of the equipment costs enumerated is an almost unvarying proportion. In 1927 it was 18·4 per cent., as it was in 1921. The only considerable single item is represented by materials, such as timber, explosives, oil, water, etc., the cost of which has varied between 1s. 8d. and 1s. 11½d. in the ton, and has accounted for 9 per cent. of the total pit-head cost or for half the total equipment costs. The remaining 9 per cent. is covered by repair costs, power generation costs, rents and royalties, etc., each of which represents a small item falling below 7d. in the ton.

It is clear that the greater part of the charges represented by equipment are for items the price of which is not dirctly controllable by the colliery management. The only partial exception is perhaps the depreciation charge.[5]

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[4] "N.S.W. Official Year Book."

[5] Even should the management seek to make for itself too generous an allowance on this score, it is within the power of the Taxation Commissioners to skim the advantage by their own estimates for Income Tax purposes.

It is evidence of the extent to which the industry has been able to finance itself from its own shareholders' resources that interest charges on borrowed outside funds represent only a trifling element in pit-head costs per ton.[6]

Rents and royalties differ somewhat in their nature from other equipment costs in not being subject to the variations of commodity prices on the open market. But they are none the less variable and are not controllable from the side of the colliery management itself. Thus between 1921 and 1927 their cost as a pit-head charge on the Northern field has grown from 4·2d. to 6·1d. in the ton. Of this average cost, payments to the Crown represent a little more than twice the amount to private land-owners. It was stated earlier in this book that in New South Wales the area of privately-leased coal lands is about one-third of the area leased from the Crown.[7] The term of a lease for coal mining in that State is 20 years, the maximum area 640 acres, the rental 2s. per acre, and royalty, until a few years ago, 6d. a ton on all large and 3d. on small coal raised.[8]

Prior to the passing of the Mining Act of 1906 the royalty payable by lessees of coal areas was 6d. a ton on all coal sold. As an encouragement to the sale of small coal, however, the scale was altered and royalty accepted by the Crown at the rate of 6d. for large and 3d. for small. The 1906 Act gave statutory force to this arrangement, but an amending Act in 1918 restored the all-round royalty of 6d. a ton for both large and small coal during the period of the 20 years for which leases are initially granted. Both the older Acts and the new provide for the renewal of leases for further terms. Under the Acts prior to 1906 renewals could be granted for another 20 years upon such terms as to increase of rent or royalty as the Secretary for Mines should determine, provided the increase of royalty did not exceed 50 per cent. per annum of the rent or royalty previously paid for the land. Upon the adoption of the amending Act of 1918, the Minister of the day in 1920 decided that the increase should be based on a sliding scale in accordance with the pit-head selling price of coal.

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[6] See Chapter IV., Section I.

[7] In 1923 there were six times as much Crown as private land in use.

[8] Conditions governing mineral leases in the other States vary somewhat from those in N.S.W. In Western Australia the annual rental for the coal lands is 6d., and a royalty of 3d. per ton is payable during the first 10 years, and 6d. for the balance of the lease. In Queensland rent is 1s. and royalty from 4d. to 1s. per ton on all coal raised. In Victoria both rent and royalty are payable on a sliding-scale arrangement. Rent diminishes from 2s. 6d. per acre for a 40-acre area to 1s. for 640 acres or over. Royalty starts at a minimum of ½d. per ton for a 2 ft. seam and moves progressively to 6d. for a 6ft. seam. As most seams worked in Victoria are very narrow, the maximum royalty actually paid seldom exceeds 1d. per ton. In Tasmania a high rent of 2s. 6d. is charged but no royalty demanded.

Thus for the further term of 20 years of an ordinary lease the royalty is an all-round charge of 6d. when the pit-head price of coal does not exceed 10s. per ton, 7d. when between 10s. and 13s., 8d. when between 13s. and 15s., and 9d. when above 15s. Leases in force for 40 years may be extended another twenty, with royalty payments on a higher basis. Thus if the selling price of coal does not exceed 10s. the payment is 7d. per ton; if between 10s. and 13s. it is 8d.; it is 9d. between 13s. and 15s., 10d. between 15s. and 22s. 6d., 11d. between 22s. 6d. and 30s., and 1s. above 30s. The differential basis of treatment as between one owner and another implied in the arrangement,[9] as well as the examination of colliery books, has been a source of complaint by coal proprietors. Objection on the latter score has been met by the Crown stating its preparedness to consider offers by lessees of lands for the second 20 years to pay a flat rate of 9d. a ton. It is significant that the lessees have invariably requested the royalty to be fixed on this flat rate basis.

For certain leases to operate on coal under the State Water Supply catchment area and under the ocean and tidal waters royalties payable to the Crown are 3d. per ton for small and 6d. for large. The rents payable are in all leases additional to the royalties. Lessees, as might be expected, complain of the necessity of having to pay "dead rent" on areas not yet worked. The Mining Act, 1906, further provides that lessees of the coal in privately-owned lands containing privately-owned minerals shall pay to the owner of the land a rent at the rate of 20s. per acre of the surface leased, and to the owner of the minerals a rent of 2s. 6d. per acre in respect of the whole area leased, as well as a royalty, collected on his behalf by the Crown, of 6d. per ton on all coal and shale won. There are, in addition, numerous private arrangements as to leases between private owners and colliery lessees.

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[9] As mentioned by Mr. C. M. McDonald, Chairman, Northern Collieries Association, at Conference between proprietors and mine-workers, Sydney, 22nd February, 1928.

As far back as 1916 a little more than half of the coal won in New South Wales was from properties in which royalties did not figure as a separate cost. By 1926, however, non-royalty paying coal had fallen to a little over 42 per cent. of the total. Moreover, between the two years the average rate of royalty paid increased from 5·07d. to 6·73d. per ton. It is clear, then, that for the industry as a whole in New South Wales royalty charges have represented an increasing increment of cost, even though not one of major importance, in the production of coal. Of all remaining equipment costs those for the purchase or generation of electric power have probably alone shown a similar tendency to growth.

III. LABOUR COSTS.

Costs represented by the direct services of employed labour are elements in the total bill upon which controversial discussion is always centred. This is natural enough for the reason not merely that wages are by far the biggest single element contributing to the pit-head price of coal, but that they are the nominal measure of living standards for by far the great majority of human beings dependent for a livelihood upon the sales of coal.

It should be unnecessary to emphasise the distinction between wages costs as such and labour costs. The former represent the nominal measure of expenditure on labour. They may move up or down without exact correspondence in changes in labour costs. For the latter must always be interpreted in terms of the value of a net product for which labour is in part responsible. If this net product increases *pari passu* with increases in wages, labour costs have not risen; nor have they risen should the net product remain unchanged after a fall in wages. Reasoning further, it does not follow that labour costs will not increase or decrease with either a fall or rise in actual wages paid. Indeed, it is possible to ring many changes in the combination of these variables. The desirable economic combination is, of course, one from which the net value of the wage to the wage-earner and the net product to the community shall be concurrently at a maximum.

It is obvious from these considerations that neither the mine-workers' rates of earnings, nor the gross earnings received, nor even the proportion represented by such earnings in pit-head costs in any one year, are by themselves completely significant. Changes in each of these categories, however, in their relation to the community's estimate of the net value of the coal produced by the industry do have an important significance for the meaning of labour costs. The fact, which has been reiterated more than once, that the coal-consuming communities both inside and without Australia are declining to put upon Australian coal the same estimate of value as its vendors at least raises the question how far labour costs, not merely wage rates nor wage earnings, have contributed to an uneconomic situation in the production of coal.

To find an adequate answer to this question is not a process of simple mathematical calculation. The intertwining factors are as much qualitative as quantitative. We must therefore find a conclusion by a balancing of the influences of like as well as unlike elements in a confusing picture of change over a period of years.

It will be first necessary to consider the meaning of labour costs in two distinguishable periods during which notable changes in cost relationships generally have come to disturb the coal industry in recent years. The first of these covers the period 1914-1915 to 1920 and the second from 1921 to the present day. The disturbances of the first period were made critical by the events of the war and of the after-war boom which culminated in 1920, whilst those of the second, though less dramatic until 1928, were a direct outcome of the relationships established in the war period itself. Unfortunately data in respect of all the elements relevant to our question for both periods are not available in complete or suitable form. Table XI., however, which has been constructed from such authoritative sources as could be drawn upon, assembles sufficient data for an analysis leading to certain broad conclusions as to the industry in New South Wales.

Rather less than half the employees in the industry are paid on contract rates, the remainder by day or weekly wages. The contract workers, as has been shown, are typified by miners, shooters and fillers, machinemen and the great majority of wheelers.[10] The day-wage workers are typified by such off-hand labour as that done by shiftmen, brattice men, and other underground employees, and the weekly wage workers by that done by banksmen, screenmen, engine-drivers, etc., on the surface. For the three selected types of worker shown in Table XI. it will be seen that basic rates of payment moved upwards by big steps in the period 1915 to 1920 inclusive. In the later period, however, the basic tonnage rates for miners remained practically unaltered, whilst day rates made one further advance of substantial account.

But rates of payment are not earnings, nor are the worker's gross earnings to be confused with his net earnings. In considering the increases in rates of payment in our first period we are concerned with a twofold question. Did they result for the miner in equivalent increases in *real* earnings and for the community in any *net loss or gain* in the service represented by coal? Whether upon the debit or credit side, and to what extent a net balance of utility is struck from this double appraisement is the real measure of variation in labour costs in the industry.

[10] Who have, of course, a guaranteed minimum daily wage.

Only one source of information as to changes in gross earnings of mine-workers in the first period is readily available. That is the Report of the Royal Commission in 1919. Mr. Justice (then Mr.) Campbell, the Royal Commissioner, prepared tables showing the number of days worked by pit and the actual daily and yearly earnings of miners, machinemen and wheelers in the several important coal fields of New South Wales from 1914 to 1918 inclusive.[11] The range of yearly gross earnings of miners and wheelers for the Northern district shown in Table XI. is taken from these tables. These figures cover only four years, but reveal an increase in gross money earnings per year. Whilst drawing attention to examples of curious fluctuations in these earnings as between different collieries in the same year and as between the same colliery in different years, the Commissioner showed that from 1914 to 1918 inclusive the disparities in the increase in tonnage rates and actual *daily* earnings for miners in the State were as follows:—

District.	Percentage Increase in (a) Basic Tonnage Rates.	(b) Daily Earnings.
Maitland	31·25	43·15
Newcastle	22·5	37·5
Southern	26·5	35·5
Western	25·5	57·5

As, however, there was considerable contraction in the working time in pits from 1915 to 1917,[12] the gross *yearly* earnings on the average showed marked fluctuations as between workers in different fields and different mines between 1914 and 1918. Indeed, in numerous collieries where daily earnings grew the yearly earnings diminished. Possibly half the time lost in collieries during the period was due to interruptions connected with war-time shipping, the other half to disputes in the industry. The latter fact, combined with the capacity of the mine-workers for growing *daily* earnings, led the

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[11] See Tables 5 to 5f of his "Report (Covering Questions, 1 to 10 inc., of the Commission.)"

[12] Except in the Western district. Working time was worse on the Newcastle than on the Maitland field.

Royal Commissioner to conclude that "the miners, as well as the other employees in the Maitland collieries, were in 1914-1918 receiving a rate of pay that, even with a reduced working time, enabled them to make a sufficient wage without unduly taxing their energies or fully availing themselves of the increase in the basic rate.[13]

This conclusion has some validity, but only to the extent that the mine-workers did consider their annual average earnings a sufficient wage for their work. In so far as they were prepared to forgo earnings through excessive voluntary absenteeism or by irresponsibly holding up the mines pending the adjustment of grievances, they may be presumed to have known the price that they were paying, and could have no complaint about insufficient total earnings. But there is plenty of evidence to show that it was largely because of the increasing living costs which had been mounting up from 1911 that the miners were restless[14] about both their rates and actual earnings, to such a degree, indeed, that the usual tactics of stoppages and strikes were adopted in the hope of maintaining, or maybe raising, the basic rates to which all actual earnings are ultimately related. Wholesale prices generally (see Table XI.) from 1914 to 1918 rose by increasing and successive steps of 6, 16 and 12 per cent., and did not cease to grow (by two more steps of 9 and 20 per cent.) until reaching their peak level in 1920. The cost of living itself had risen by about 28 per cent. from 1911 to 1915, and by a further 8 per cent. by 1918, and by a still further 30 per cent. by 1920. (See Table XI.) As to gross annual earnings of mine-workers (from which at least 5 per cent. must be deducted in respect of explosives bought by men "at the face"), with tonnage rates unchanged, time worked showing little variation from the general experience of the industry, and the cost of living increasing by over 30 per cent., it

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[13] "Report," p. 38.

[14] Indicated in the logs submitted by the Miners' Federation in respect of wages and hours in 1915 and 1916, and by the strike in the latter year. Restlessness, on account of the continual decline in the value of wages, was added to, not only by intermittency of work, but by the unsettling conditions produced by the war. It is notable, for instance, that miners engaged in several one-day strikes as a protest against conscription. (See "N.S.W. Year Book, 1921," p. 660.)

TABLE XI.

DATA FOR DETERMINING CHANGES IN LABOUR COSTS, 1915–1928.

(See Explanatory Notes.)

	1915.	1916.	1917.	1918.	1919.	1920.
Rates of Payment (*a*)						
Miner (per ton round)	2/7.5–4/2	2/11.5–4/6	3/4.8–5/2.1	3/4.8–5/2.1	3/9.5–5/11.3	4/7.8–5/11–6/11
Wheeler (per day)	8/-–9/1	8/-–9/1	10/6–11/8	10/6–11/8	13/-–14/9	15/7–17/9
Shiftman (per day)	8/6–12/4	8/6–12/4	10/11–15/6	10/11–15/6	14/-–18/1	17/-–21/1
Gross Yearly Earnings (*b*)						
Pick Miners on Contract — North — Maitland	£175	£199	£217	£234	Corresponding Data not Available	
Pick Miners on Contract — North — Newcastle	£142	£158	£188	£190		
Pick Miners on Contract — South	£149	£142	£158	£172		
Pick Miners on Contract — West	£143	£173	£188	£210		
All Employees — North (Ex Salaries)	No Estimate Possible	No Estimate Possible	No Estimate Possible	No Estimate Possible	No Estimate Possible	No Estimate Possible
All Employees — State (Ex Salaries)						
Wages Cost per Ton Raise (*c*) All Employees—North (Ex Salaries)	No Estimate Possible	No Estimate Possible	No Estimate Possible	No Estimate Possible	No Estimate Possible	No Estimate Possible
Average Pit-Head Value Per Ton Raised. Estimated. North	7/7	9/1	11/5	11/8	13/6	15/3
Delivery-at-Wharf Price per Ton—North						
Best Coal—Large	11/-	12/-	15/-	15/-	15/-, 17/9	17/9, 21/9
Best Coal—Small	7/-	8/-	11/-	11/-	11/-, 13/9	13/9, 17/9
Tonnage Consumed in N.S.W.*	4,780,600	4,693,000	5,029,100	5,641,500	5,128,500	5,729,200
Per Capita Consumption N.S.W.*	2.53	2.48	2.64	2.90	2.56	2.77
Tonnage Output per Mine Worker						
North: Per Year	495	462	465	517	458	524
State: Per Year	526	485	482	540	478	541
State: Per Man Day†	2.69	2.54	2.73	2.67	2.35	2.43
N.S.W. Wholesale Price-Index (*d*) (1911 = 1000)	1401	1489	1727	1933	2090	2503
N.S.W. Retail Price-Index (Food and Rent). (1911 = 1000)	1281	1351	1365	1383	1531	1791

TABLE XI.—Continued.

DATA FOR DETERMINING CHANGES IN LABOUR COSTS, 1915–1928.

(See Explanatory Notes.)

	1921.	1922.	1923.	1924.	1925.	1926.	1927.	1928.
Rates of Payment (*a*)								
Miner (per ton round)	2/5.7–6/11	2/5.7–6/11	2/5.7–6/11.8	2/5.7–6/11.8	2/5.7–6/11.8	2/5.7–6/11.8	2/5.7–6/11.8	2/5.7–6/11.8
Wheeler (per day)	15/7–17/9	15/7–17/9	15/7–17/9	15/7–17/9	18/3–18/9	18/3–18/9	18/3–18/9	18/3–18/9
Shiftman (per day)	16/6–21/1	16/6–21/1	16/6–21/1	16/6–21/1	18/-–22/1	18/-–22/1	18/-–22/1	18/-–22/1
Gross Yearly Earnings (*b*)								
Pick Miners on Contract: North: Maitland	Corresponding Data not Available							
Pick Miners on Contract: North: Newcastle								
Pick Miners on Contract: South								
Pick Miners on Contract: West								
All Employees: North	£275	£260	£234	£280	£265	£253	£260	Not Available
All Employees: State (Ex Salaries)	£269	£252	£237	£269	£255	£246	£261	
Wages Cost per Ton Raised (*c*) All Employees—North (Ex Salaries)	10/6	10/9	10/8	10/10	11/1	11/3	11/7	Not Available
Average Pit-Head Value per Ton Raised. Estimated North	17/7	17/6	17/7	17/8	17/7	18/10	19/2	Not Available
Delivery-at-Wharf Price per Ton—North								
Best Coal—Large	21/9	21/9	21/9	21/9	21/9	23/3, 24/3	25/-, 25/6	25/-
Best Coal—Small	17/9	17/9	17/9	17/9	17/9	17/9, 18/9	19/6, 20/-	19/6
Tonnage Consumed in N.S.W.*	5,268,600	4,943,700	5,578,400	6,204,300	6,625,900	6,347,200	6,786,900	6,102,000
Per Capita Consumption in N.S.W.*	2.49	2.29	2.54	2.78	2.92	2.73	2.86	2.52
Tonnage Output per Mine-Worker								
North: Per Year	502	470	426	508	461	429	425	416
State: Per Year	512	470	456	505	474	439	454	439
State: Per Man Day†	2.35	2.22	2.23	2.34	2.31	2.36	2.38	2.5
N.S.W. Wholesale Price-Index (*d*) (1911 = 1000)	1956	1800	1925	1874	1854	1834	1840	1802
N.S.W. Retail Price-Index (Food and Rent). (1911 = 1000)	1672	1586	1685	1662	1709	1790	1776	1783

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*Includes boiler coal used at mines, dirt, waste, etc., also bunker coal loaded in port of Sydney on Interstate vessels. No allowance is made for stocks carried over. This is the quantity of year's product made available for consumption within the State.

†Basis of calculation: Coal raised divided by the product of number of mine-days worked and average number of employees. Days worked by maintenance staffs on idle days are not taken into account.

NOTES TO TABLE XI.

(*a*) *Rates of Payment.* Data from New South Wales Statistical Register. It is difficult to quote typical hewing rates. The wide range is due to the very variable conditions under which coal is won. The lower rate is for machine-won coal. The maximum rate quoted probably gives a fairly accurate idea of the trend of variations. "Consideration" or concessions, of course, modify the effect of the rates on earnings.

(*b*) *Gross Yearly Earnings.* The averages quoted for years 1915 to 1918 are calculated from the typical large mines for which these data were published in the Campbell Report of 1919. They are unweighted averages for the following number of mines—Maitland field 10, Newcastle field 13, Southern 10, Western 7. The average yearly earnings of wage employees shown for 1921 to 1927 are from returns collected by the N.S.W. Government Statistician. The earnings shown are gross in all cases. Net average earnings for miners would be about 10 per cent. less and for all employees 5 per cent. less.

(*c*) *Wages Cost per Ton.* Coal raised divided into wages paid.

(*d*) *Price Index Numbers.* The wholesale price index number is quoted for comparison with the selling price of coal and the retail price index number for reference in connection with wages and cost of living.

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is probable that real earnings from 1908 to 1915 declined appreciably. From 1915 to 1918 evidence points to an increase of about 25 per cent. in gross earnings, while cost of living increased by 8 per cent., thus enabling some catching up in the lag. From 1918 to 1920 the mine-workers apparently held this recovered ground, for, although the cost of living rose steeply by about 30 per cent., it can be inferred that the gross earnings rose by a like proportion. The big advance in hewing and day rates of September, 1920,[15] however, lifted the workers into a position more favourable than that enjoyed in 1914,[16] for cost of living in 1921 fell by about 7 per cent. It appears on the available evidence, then, that the rises in wage rates in mining during and immediately after the war period resulted, not necessarily in equivalent increases in *real* earnings with each change in rates, but in standards in mining wages by the end of 1920 more than favourable in comparison with those of workers in other callings.

What net loss or gain, meanwhile, did these changes in money wage standards in mining bring to the community itself through the service represented by coal? In the first place, as stated in an earlier chapter, the absolute and relative tonnages of coal consumed in New South Wales, despite the great difficulties of supply experienced by other States and New Zealand, did not cease, except in 1919, to exhibit an upward movement between 1915 and 1920, the relative growth being reflected at least faintly in the per capita coal consumption for the State (see Table XI.). But whereas wholesale prices generally rose by 78 per cent., the pit-head price for coal rose by probably 98 per cent., the f.o.b. price for large by a similar percentage, and that for small by 153 per cent., a combined rise of about 116 per cent., assuming the sales to be in the ratio of two tons of large to one of small. While this progress in home consumption tended to keep buoyant the annual tonnage output per mine-worker, despite the intermittency caused by shipping difficulties for mines serving the Interstate and overseas trade, the mine-workers' output per man-day showed a definite tendency to fall. It would appear from these considerations that the general community, as compared with its pre-war experience of net utility from the service of coal, received rather less than more in the period 1914 to 1920. The coal industry, in other words, was, during the period, being run on a scale of really higher costs from the consumers' standpoint. The coal proprietors' gains represented some portion of these extra costs, to the degree, at any rate, of enabling them to maintain the same relatively advantageous position enjoyed in 1914; nor is it to be denied that the mine-worker, at little net gain in real earnings except those won by standards maintained, shortened actual working hours,[17] and a widened range of "consideration" money, themselves contributed new elements of non-productive costs inevitable in increased absenteeism[18] and dogged belief in the virtues of harassing local stoppages.

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[15] 1s. a ton on hewing rates, 3s. a day on day rates.

[16] Though not necessarily better than that of 1911.

Thus by 1920 the coal industry had accumulated a burden of really higher labour costs. What changes have occurred in cost relationships in the period since appear to have added to rather than to have diminished them. This conclusion is not to be found in any simple reading of changes either in rates of pay or of average gross earnings. As a matter of plain fact, the basic tonnage rates of miners have altered scarcely at all since 1920, the basic day wage of off-hand labour has been increased once only, and that by 1s. a day,[19] since 1924, and the gross earnings of all employees (except those on salaries) in the New South Wales industry have varied *both ways* by from 5 to 7 per cent. about a median of £255 per annum.[20] The gross earnings of the mine-workers have apparently made no real progress. Meanwhile the average wages cost per ton of coal raised, the pit-head price per ton saleable, and the declared delivery-at-wharf prices both for large and small have been progressively increasing.

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[17] Following the strike for 8 hours, bank to bank, in 1916.

[18] In a representative colliery, for which annual records are kept by the N.S.W. Department of Labour and Industry, the number of casual shifts lost annually increased progressively from 2,585 in 1916 to 5,870 in 1924. The average number of places cavilled annually was 131. Miners were absent 11.8 and wheelers 1.9 per cent. of their working time.—"N.S.W. Industrial Gazette," 28th February, 1925, pp. 456 and 509.

Payments for manual labour represent by far the biggest single item of cost in the production of a ton of coal. Since 1920 they have ranged between 60 and 63 per cent. of the total pit-head charges in the Northern district.[21] Moreover, increases in these payments represent about two-thirds of the increases in the pit-head price since that year (see Table XI.). Increases in wages costs in the mines themselves, it is clear, have been an element of no slight importance in raising the price of coal, even though rail freights are to be held accountable for the increased margins between pit-head and the declared delivery-at-wharf prices in the period 1921 to 1928. How, then, are these increases in wage ton-costs to be explained in the face of stationary tonnage rates for miners and for the instability-without-progress of actual earnings of all mine-workers?

The explanation is to be found in part in certain of the human factors discussed in Sections I. and II., Chapter III., and in Chapter VIII. generally, of this book. The acquisitive instinct of the miner has served him at one point of his earnings but to rob him at another. From bearing the brunt of intermittent trade he is never entirely free. But to this, and partly as a cause of it, he has added the self-imposed burden of losses in a guerilla warfare which never ends in a final victory, but does keep average earnings depressed below their possible limit. This is part of the cost-incidence of the excessive local stoppages which have made coal-mining a by-word for many years. It is doubtful, in other words, whether the multiplicity of industrial dislocations which have marred the steady working of the industry have been worth their cost to the mine-workers.

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[19] Or by about 5 per cent.

[20] Average earnings on the Southern field have been on the whole lower than those on the Northern and Western.

[21] Salaries have ranged between 2 and 3 per cent.

But industrial dissidence, although probably the most important contributor to increasing labour costs, which depress real earnings and hinder the progressive growth of utility from the mining industry, does not in itself explain the disparity between stationary nominal tonnage rates and growing wages costs. This disparity has arisen from the pressure by which the mine-workers generally, and the miners in particular, have been able to secure "plus" earnings in the form of "consideration" money already described. These "frills of the industry" are not dependent upon changes in basic tonnage or day rates, but their growth in recent years has contributed notably to the increase in wages costs. A less obvious but a very real contributor to the same process has been the virtual compulsion to which the managements have been subjected to increase the proportion of off-hand labour or service workers to the number of men actually winning coal at the face. Proprietors in numerous instances have also complained of the burden added to costs by the miners' imposition of the "darg," but it is questionable whether, in collieries equipped with an adequacy of trucks, this has been a cost factor of any significance. The liberalising of the workmen's compensation and family endowment contributions payable by the owners is possibly on general grounds warranted, but it, too, has added within the last three years to the employment cost per ton. Had all these costs been accompanied by increased tonnage output per mine-worker per year or per day, and had there been any real correspondence between the trend of coal prices and that of general prices, the conclusion might be avoidable that since 1920 labour costs have been growing uneconomically high in the coal industry.

IV. OVERHEAD COSTS AND PROFITS.

After the costs both of equipment and labour are taken into account there remains a number of other items which make up the pit-head cost of producing coal. Some of these may be broadly described as overhead costs, even though including items not coming within the strict accountancy meaning of that term, and the remainder as gross profits.

Thus among those which we shall call overhead are such general costs as insurance, local rates and taxes, maintenance of rescue stations and bath houses, directors' fees, office expenses, and perhaps selling charges. Insurance in respect of Workers' Compensation payments we have already included under labour costs. What remains after all the equipment, labour and overhead charges have been met is the gross profit. It is a gross balance from the viewpoint of the colliery owner, inasmuch as from it must be paid State and Federal income taxes before the net profit can be realised.

To the private investigator access to a knowledge of the extent of these detailed costs is unfortunately barred by the business policy of the coal owners. In the analysis of pit-head costs generally he has available certain selected statistics as to equipment costs, employment costs and total pit-head costs published in the New South Wales Statistical Register, which are based on returns from 1921 to 1927 inclusive collected from owners by the Government Statistician under the authority of the Census Act 1901. Beyond these he must rely on his powers of deduction and upon whatever authoritative pronouncements may be made from time to time.

Thus, allowing for the deductions already mentioned in respect of boiler coal, miners' coal and dirt which leave a net saleable output, it may be safely inferred that, as between 1921 and 1927, the proportion of average total pit-head costs represented by equipment charges has remained in the Northern district of New South Wales at about 16 per cent., and that by wages and salary charges at between 63 and 66 per cent. The remaining items of overhead and gross profit have, therefore, together represented on the average between 21 and 18 per cent. of the total. Just what part the overhead items of selling charges, head office expenses, directors' fees, general charges (not specified), general insurance, postage, rescue stations and bath houses, local government rates and taxes, donations, "etcetera," represent in these remaining percentages is not made clear by any published figures. It is the final balance of gross profit (inclusive of income tax and family endowment payments) left after the subtraction of these overhead cost items which, of course, intrigues the public interest. Before this final balance of average gross profit can be ascertained, the part played by the overhead costs enumerated must be known with certainty. It is one of the functions of the Royal Commission at present sitting to put this question beyond doubt.

About the middle of 1928, consequent on the crisis which had developed in the industry, the Government of New South Wales requested the proprietors on the Northern fields to submit their books with a view to enabling the Government to judge the extent to which they could be fairly expected to contribute to a scheme of price reduction, which might remedy the distressing situation. This request was acceded to by all the colliery enterprises save one.[22] A careful examination of the cost figures shown in the books, backed by several methods of circumstantial check, revealed an average gross profit for mines in the Northern district in the calendar year of 1927 of under 2s., representing about 10 per cent. of the total average pit-head value per ton. For the years 1921 to 1924 it can be assumed to have been somewhat greater on account of lower compensation and income tax, the absence of child endowment deductions, and of greater regularity of working, but not so great as to suggest extravagantly high profit earnings per ton on the average. For the Southern and Western fields, *until* 1928, circumstantial evidence suggests higher average profits than on the Northern. The prevailing general average for the whole State was announced by the Premier in early 1929 to be in the vicinity of 2s.

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[22] Premier's speech in Parliament, 14th September, 1928. The books of the Southern and Western proprietors were submitted at a later stage.

Such, then, are the data on overhead and profits as pit-head costs available to the outside investigator. Unfortunately, being in terms of averages, they reveal nothing of the disparities in costs and earnings as between particular mines. Averages present a blurred, if still useful, picture, in which the inefficient and efficient, the losers and the highly successful, are not to be distinguished. That the years 1920 to 1925 presented opportunities for large aggregate profits is written in the expansion of the large companies and in the growth both of their tonnage output and value; but it was also a period of unsuccessful operations for some concerns. Even amid the distresses of 1928, when large and small were involved in common misfortune on all fields, at least some mines, from "pot-holes" to large joint-stock companies, were enjoying profits on their output not otherwise to be described than handsome.

V. TRANSPORT AND MARKETING COSTS.

The items of cost so far discussed are those incurred in the colliery operations themselves. But the bill of costs to the consumer directly, and to the coal proprietor indirectly, is swollen by numerous handling charges incurred up to the final point of delivery of coal. Some of them constitute a small part of the overhead which goes to make up the pit-head price of coal, but the greater part of them are external to the mine costs proper, and contribute to the big disparities paid for similar coal in different localities. These disparities, of course, have their basis in the different distances of the consumers' markets from the coal fields.[23]

As far as the fields[24] which exercise the governing influence upon coal prices in Australia are concerned, it is not the pit-head costs alone which provide the basis of declared price, but these plus the costs up to the point of shipment at Newcastle. Thus prices are normally quoted as "at the cranes, Newcastle." The charges which have to be met between the pit-head and the wharf are virtually an addition to operating costs, and may serve either to diminish or improve competitive capacity as between collieries situated at different rail distances from the sea.

The most direct and important of these charges is the cost of hauling coal by the railways. The bulk of the coal hewn in the Northern district of New South Wales is carried over both private and Government railway lines, practically all of it being borne in 14,800 colliery-owned coal waggons, which are drawn over the private lines by private engines and over the Government lines by the locomotives of the Railway Department. Thus a coal company in Cessnock is to-day charged 1s. 0·15d. per ton for the haulage of large coal for 17 miles on the South Maitland Railways Ltd. and another 2s. 7d. per ton on the remaining 21 miles of Government line to the point of shipment. These charges, however, do not cover every detail of transport expense. Some collieries have to meet wayleave, shunting, demurrage and other costs, among which lubrication and upkeep of colliery-owned rolling stock is alone claimed to amount to from 8¾d. to 10d. a ton.[25] Losses of coal in transit, as when the Railway Department's weights of coal are less than those for which hewing and other rates have been paid at the mine, may also add to these items.

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[23] These disparities do not necessarily add to the profits accruing to the coal mining companies, and to the extent that they do so they appear in the average profits already quoted.

[24] Maitland and Newcastle.

Associated with the rail transport costs proper, but additional to the declared delivery-at-wharf price, are the charges made by the Railway Department for craneage service and the Navigation Department's harbour rate. The former to-day are a "plus charge" of 10d. and the latter of 3d. per ton, from which the consumer of coal shipped at Newcastle cannot escape. The f.o.b. price for large coal at Newcastle is thus 26s. 1d. and for small 20s. 7d.

It has been the recent stepping up of these land transport and associated charges, more particularly those imposed by Government departments, about which coal proprietors have been most loudly clamant in criticism, and which they have called in question as "necessary" to the costs of coal production. Thus they point to no less than five distinct rises since 1916 in departmental railway freight rates for coal hauled for local use, representing an increase of 134·9 per cent.[26] Whilst the Department's haulage rate from East Greta Junction[27] to the Dyke, Newcastle, a distance of 21 miles, was 1s. 1 1/3d. in 1914, and included the shipment of coal, to-day it is 2s. 7d., exclusive of the 10d. per ton for craneage service. On the South Maitland Railways the charges have also increased, but not in the same proportion; for from Cessnock to East Greta Junction, a distance of 17 miles, the 1914 rate was 8½d. a ton, as against 1s. 0·15d. to-day. Craneage and harbour rates have in the meantime become separate service charges, the former having increased twice since the innovation of both types of charge in September, 1921. The crane rates began at 6d. a ton for all hoppers and waggons, of whatever type or ownership, were modified in 1922 to secure 1d. and 2d. more for double door hoppers and box waggons respectively, and were again revised in 1926 to 10d. for all departmental waggons and for owners' single-door hoppers, to 11d. for owners' double-door hoppers, and to 1s. for owners' box waggons.

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[25] Mr. C. M. McDonald, Chairman, Northern Collieries Association, at Conference between proprietors and mine-workers, Sydney, 22nd February, 1928. The maintenance of colliery rolling stock is more correctly to be regarded as transport than equipment cost.

[26] For the average of 34 freight miles hauled, the actual increases have been: For local use, from 3s. to 5s. 5d. per ton; for shipment, from 1s. 5 2/3d. to 3s. 5½d. per ton.

[27] The point at which Departmental engines take over the coal trains from the South Maitland Railways.

As Newcastle is, of course, the port of greatest coal tonnage shipment in the Commonwealth, the shipment service charges associated with it receive the greatest criticism. But coal in large quantities is, of course, shipped from and into other New South Wales ports. Craneage charges in Port Jackson are identical with those in Newcastle. Moreover, inward and outward coal rates, as well as those on transhipment, levied by the Sydney Harbour Trust Commissioners have increased three times since 1917.[28] In the smaller ports of Port Kembla and Wollongong the Public Works Department attends to coal shipping, for which a charge (embracing shunting) of 1s. is charged at Port Kembla and 6d. (without shunting) at Wollongong. These charges have not varied since 1915.[29] The private mining companies controlling jetties at Bellambi and Bulli, it is understood, charge 9½d. a ton for shipment service.

Such are the more important transport and associated charges against which the New South Wales coal owner girds. To his complaint of unfavourable treatment in the matter of charges for Governmental services he adds a protest against the losses he must incur because port loading facilities are inadequate for peak period shipment and involve money-costing delays. Indeed, the burden of his complaint is that, in so far as he is compelled to depend upon State Government services, he receives unmerited discouragement. True, for many years the Railway Commissioners of New South Wales have made a discriminating freight charge in favour of coal hauled for shipment as against that hauled to home consumer by rail; but, whereas in 1913 this preference was a 50 per cent. reduction on the latter rates, by 1928 it had become reduced to 36 per cent, and the actual rates increased by 135 per cent. as against the increase of 81 per cent. for haulage to the local consumer. The New South Wales coal shipper contrasts this with the additional encouragements given to coal shippers in Queensland, where rebates are given on wharfage and harbourage charges, and in South Africa, where, in addition to greater rail freight discrimination in favour of export coals, the special rebate inducement on bunkers already described is made available. It is not only the Northern coal owner who has his complaints. Western and Southern voices are joined in the protest against rising railway charges, and in the West a special complaint is added that "shortage of trucks has never been improved."[30]

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[28] From 3d. per ton for inward and outward coal, and 1½d. for transhipment in 1917, to 1s. for inward, 6d. for outward, and 6d. for transhipment in 1920. For a few months in 1917, 3d. was also charged on bunkers, which are now included in the transhipment rate.

[29] Except for the addition at Port Kembla of 3d. a ton on bunker coal in 1922.

All this presents a formidable bill of accusation. But it may reasonably be asked whether the charge of unfair treatment can be sustained. In the first place it may be assumed that prejudice in any case is heavily loaded in the minds of private enterprisers against Government services, just because they are of the Government, and the condemnation should be discounted accordingly. In the second place, it is expected of the Government Railways that they should be run by precisely the same canons of sound business as are supposed to guide the coal proprietor in his affairs. When costs imposed upon the Commissioners rise they inevitably seek their recovery in the price charged for the services rendered by the Railways. The nominal price level since 1913 has risen inordinately, not for a few goods but for *all* commodities and services; so that actual value relationships have not been greatly disturbed, and the absolute magnitude of percentage increases in prices themselves loses much of its

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30. Mr. J. S. Bragg, Secretary, Lithgow Coal Association, at Conference between proprietors and mine-workers, Sydney, 23rd February, 1928. He cited a delay of 65 days in getting trucks in the West in 1926, and estimated that the delays through Government truck shortage add over 1s. per ton to the cost of Western coal.

significance. Thus it is not the absolute extent of the increases in the items of cost which the Railway Administration has had to face between 1913-1914 and 1926-1927, involving 78·57 per cent. in the average rate of wages paid, 67·06 per cent. in the index price of materials purchased, 39·87 per cent. in the average rate of interest charged, and 117·31 per cent. in the average price of coal bought, but the relative disparities in the growth of these several main costs which are significant. It is notable that the declared price of large coal in the same period rose by 127 per cent.

Coal itself is not the least of the material charges which the Railways have to meet. As pointed out earlier, this element of cost to the community in general has continued to rise since 1921, while the prices of other materials, the cost of living and wage rates based thereon have shown a slight tendency to fall. In the sum, the necessary costs of production of railway administration, in the first of the two senses in which that phrase was discussed at the beginning of the chapter, have mounted up since 1920, and the coal industry itself is in part responsible. In addition, the irregular working of the collieries, which creates very serious difficulties in railing and loading, the inability of the Commissioners safely to use their locomotives to full-load capacity because of the relatively inefficient rolling-stock of the collieries, and the complicated shunting and marshalling involved in the multiplicity of ownership of waggons, all work themselves out in increased costs of railway service.[31]

From the viewpoint of the Railway Commissioners, the carriage of coal has never been a source of satisfactory return, more particularly as it represents nearly half the weight of freight carried by the Railways.[32] The principal points taken into consideration in fixing freight rates generally on the Government Railways are: (i.) Value of the commodity; (ii.) whether in crude or

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[31] For amplification see Mauldon: "A Study in Social Economics: The Hunter River Valley," pp. 136-138 and 144-146.

[32] 60.08 per cent in 1918, 47.02 per cent in 1927. In terms of ton-miles, however, the percentage in 1927-1928 was only 16.

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manufactured state, and purpose for which it is to be used; (iii.) whether the commodity will bring other traffic to the railway; (iv.) whether it will be sent in truck loads or smaller lots; (v.) whether it is bulky in proportion to weight; (vi.) what competition the commodity itself, as well as the Railway Department, will have to meet.[33] So coal, being a primary product of relatively low value, is lightly rated as compared with commodities which can bear a higher charge. Thus the business "value of service" principle is tempered with the mercy of discrimination to aid the weak. The Railway Commissioners cannot fairly be charged with ruthlessness in their treatment of coal owners. But as a *business* administration they have undoubtedly sought, since 1921, not only to meet growing costs, but to redress the unsatisfactory position in which the carriage of round about 8,000,000 tons of coal annually persistently leaves them.[34]

The Railway Departments of other States adopt substantially the same principles of rate fixing and face substantially the same problems of coal carriage, though in far less degree. In Victoria the railway administration meets the anomalous situation of State collieries, with which it is linked by ministerial administration, being unable profitably to meet the fixed freight charge by a subsidy from railway earnings. That the Victorian Railways also have found that "there is nothing in coal" is suggested by their steady refusal to place the briquettes of the Electricity Commission in the coal freight classification,[35] even though they do discriminate in favour of Victorian as against New South Wales coals.

The transport charges so far discussed are for the land carriage of coal. But at least a half of the coal hewn in Australia is borne to some point of disposal in the holds of sea-going vessels. Government does not provide these transport services to the coal vendor.

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[33] "Bulletin. No. 36." Bureau of Information, Railway Department.

[34] Earnings per ton-mile on coal haulage were .47d. in 1913, .76d. in 1920, 1.21d. in 1921, 1.39d. in 1927 and 1.55d. in 1928.

[35] Investigations have shown that coal rates would not meet the cost of hauling briquettes, which are therefore charged the higher rates for firewood.

Indeed, practically the whole of the coal carried by sea from all parts in New South Wales, except in regard to oversea trade, is carried in vessels either directly owned by colliery proprietors or by shipping companies with which they are organically linked and from whom the lowest possible freight charges would be expected. Yet the available evidence goes to show that between 1914 and 1928 shipping freight rates, both Interstate and coastal, have advanced in approximately the same degree as the average for all classes of coal freight on the New South Wales Railways.[36]

In 1928 the best Newcastle and Maitland coals were being delivered to industrial consumers in Yarraville, Melbourne, at not less than 45s. a ton and to domestic consumers at 57s. a ton. With the declared price at Newcastle 25s., craneage, harbourage and other port charges about 2s. 6d., and ocean freight 12s. 6d., or on a contract basis about 11s. a ton, inclusive of about 2s. for coal trimming at Newcastle, it will be seen that other handling charges supervening between coal producer in New South Wales and industrial consumer in Melbourne amount to about 6s. 6d. a ton, or round about 25 per cent. of the declared selling price at Newcastle. For the domestic buyer of small lots in Melbourne suburbs, handling charges amount to no less than an additional 17s. 6d. Whilst the price of coal delivered to industrial customers is fixed by contract directly with the coal mining companies, the retail price to the domestic consumer is determined by the charges of intermediaries.

That all the foregoing transport and marketing costs added to the pit-head price of Maitland or Newcastle coal are to the Interstate consumer "necessary," in the sense that he must pay them or not have the coal, goes without saying. As to their necessity in an economic sense, the question cannot adequately be answered without such detailed examination of the whole machinery of marketing as does not lie within the power of any private investigator. There is, however, *prima facie* evidence of inflated costs up to the point of consumption in the losses of Interstate sales of New South Wales coal, which in Victoria have fallen progressively since 1924 by nearly 600,000 tons in the year. It may be presumed that, had it been within the power of the coal-shipping coalitions to prevent this loss by squeezing out every element of unnecessary costs in shipping freights, their self-interest would have dictated such economies. But, as with the railways, the major working costs in shipping are not amenable to the pruning-knife.

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[36] Viz., about 100 per cent. The shipping freight rate on coal from Newcastle to Melbourne for gas production has risen by eight successive stages from 5s. 4d. per ton, including labour loading into tubs in hold of ship, in 1914 to 11s. in 1928. Freight from Newcastle to Sydney in the same period has risen from 3s. 6d. to 7s. a ton. Increases in N.S.W. railway freight rates for different distances of coal haulage varied between 59 per cent. and 150 per cent., or, on an average, 101.7 per cent.

VI. THE DILEMMA OF PRICE.

"The outstanding fact about coal prices," observe writers on the American problem, "is their infinite variety."[37] Shorn of its exaggeration, this observation has truth also for coal prices in Australia, though not in the measure of its truth for countries like the United States, with a far wider range of sellers and buyers and in which monopoly control of coal price is much less possible.

Although coal fuel in particular quantities or form drawn from particular fields and collieries to particular consumers is disposed of at differential prices calculated to win a maximum of custom, it remains broadly true that the prevailing level of all coal prices in Australia is based upon the f.o.b. price of coal at Newcastle, New South Wales. This virtually means that coal prices tend to conform to the standard set by the minority of Northern owners, more precisely the twenty members of the Northern Collieries Association, whose aggregate output of first-grade coal is of sufficient magnitude to give an effective though not entire monopoly. The balance of the coal sold from other collieries throughout the Com-

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37. "There are different prices for coals that differ in kind, or in name, or are taken from different mines. There are also different prices to different consumers for coal from the same mine . . . Differences in price correspond only roughly with differences in quality."—Hamilton and Wright: "The Case of Bituminous Coal," pp. 68 and 69.

monwealth has never been able seriously to disturb this powerful entrenchment. Coal prices quoted by these other collieries have played about a scope just below the Association price at Newcastle. On the one hand, the force of attraction has tended to draw them to this upper limit; on the other hand, competition for a limited market, serving which geographical situation of the colliery or some special quality of the coal may give a comparative advantage, has tended to force them downward.[38]

It is therefore possible to generalise with some safety about the general trends in coal prices in Australia. From 1908 to 1915 the f.o.b.[39] price of coal at Newcastle remained unchanged at 11s. a ton. But in the second year of the war the beginnings of the rising tide of living prices were felt by the miners. One result was the agreement between owners and men whereby the hewing rate was increased by 4d. to 6d. a ton, day wages increased by 6d. to 1s. per day, and the selling price of coal fixed at 12s. a ton as from 1st January, 1916. Despite the sanction given to this price arrangement by the State Necessary Commodities Commission, public opinion outside the coal industry was aroused by what it regarded as a "conspiracy" against the consumer. New claims by the miners in 1916 in respect both of wages and hours, the serious strike through all November, and the decision of a special tribunal set up under the War Precautions Act, resulted in the tribunal increasing hewing rates and day wages 15 and 20 per cent. respectively and the price of coal by 3s. From January, 1917, to May, 1919, the f.o.b. price for large coal at Newcastle

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[38] Thus quoted prices for large coal from the three main fields in N.S.W., in 1928, were:—

Northern	26s. 1d.	f.o.b.	Newcastle
Southern	25s. 6d.	f.o.b.	Jetty
Western: (a) Lithgow	15s. 3d.	f.o.r.	Colliery siding.
(b) West of Lithgow ..	11s. 6d. to 13s. 6d.	f.o.r.	" "

(Rail freights, Lithgow to Sydney, are 10s. a ton.)

Wonthaggi (Victorian) coal is quoted in Melbourne at about 5s. 9d. under Northern N.S.W. delivery prices. Even this considerable difference in delivery price, however, does not give the Victorian fuel sold for industrial use a comparative advantage in price per heat unit; a fact indicated in the small sales outside the Victorian Railway Department, despite aggressive selling campaigns.

[39] For these years, and up to February, 1921, the declared price at Newcastle was "free-on-board," which was inclusive of craneage service. Since 1921, the quoted price is "at cranes," or what we shall call "delivery-at-wharf," and excluded the harbour dues and craneage rates.

was therefore 15s. Still further demands of the Miners' Federation towards the end of 1918 resulted in the Commonwealth Government's nominally taking over[40] all coal won in mines in New South Wales and concurrently issuing Orders increasing the wage-rates of miners and other contract workers by 15 per cent., adult wage off-hand employees by 2s. 7d. a day, boys and youths by 20 per cent., and the selling price of coal by 2s. 9d., 2s. 3d., 2s. 6d., and 2s. 3d. per ton respectively in the Northern, Teralba, Southern and Western districts.

Thus the price at Newcastle became 17s. 9d. in May, 1919. But the war-time uprush of prices had not yet finished. The restlessness of the mine-workers in 1920 led first in August to the appointment by the Federal Government of the Coal Industry Special Tribunal under the Industrial Peace Acts, and a month later to the appointment of a Federal Royal Commission to enquire into the necessity for further increase in the price of coal consequent on increases in wages granted by the Tribunal. This Commission subsequently issued an interim report, increasing the selling price of New South Wales coal consumed within the Commonwealth by 4s. a ton. The Chairman of the Commission as Chairman also of the Coal Tribunal, ruled in addition that the selling price of all coal sold for shipment beyond the Commonwealth should be raised by a similar amount. It was subsequently held that a flaw in the Industrial Peace Act prevented the exercise of such power by the Chairman, but, even before the Act was amended, the Prime Minister himself, under War Precautions Act powers, endorsed the Chairman's decision. Thus all large coal at Newcastle wharves came by September, 1920, to be quoted at 21s. 9d. a ton. Up to this time small coal sold at 4s. less than large.

These prices ruled for five years. The two subsequent increases for large coal to 23s. 3d. in November, 1925 (small remained at 17s. 9d.) and to 24s. 3d. in July, 1926 (small increasing to 18s. 9d.), were made by the

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[40] Under the War Precautions (Coal) Regulations.

Northern Collieries Association as a result of increases of from 1s. to 1s. 6d. a day for non-contract labour, of the liberalising of Workers' Compensation payments, and of a general rise in costs. Then came a further increase to 25s. for large and to 19s. 6d. for small, in December, 1926, consequent on increased freight charges by the State Railways. From July to October, 1927, a further 6d. was added as a result of compulsory payment by coal proprietors of a contribution of 3 per cent. on wages in respect of Family Endowment. With the suspension of the tax, however, the delivery-at-wharf price of coal at Newcastle went back to 25s. for large and 19s. 6d. for small, the prices ruling to-day.

This brief recital of the history of the dominant coal prices in Australia is essential to an understanding of the nature of the trend. It is clear that they received their first impetus upwards from the rising cost of living in the early war years, were propelled still higher in the later years by the same factor plus the desire of the mine-workers to make good the lag in wages, as well as to seize new levels of advantage in their standards, were first resisted and then tacitly acquiesced in by the proprietors as the State, by successive steps, endorsed the new levels, and, since 1920, have exhibited a behaviour apparently little related to the trend of commodity prices in general.

In 1913 the coal of New South Wales was among the cheapest in the world. Even the increases of the war years, which we have described above, were not comparable to the upward flights of price in Great Britain and the United States.[41] But, since 1920, New South Wales coal prices have been almost unique in remaining stable for five years and then rising. This phenomenon has resulted in placing New South Wales coal to-day among the very dearest in the world. The serious position in which this places Australian coal has already

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[41] Average pit values per ton raised were:—

	Great Britain.	United States.	N.S.W.
1913	10s. 1½d.	5s. 6d.	7s. 3d.
1919	27s. 4d.	12s. 7d.	12s. 7d.
1920	34s. 7d.	22s. 11d.	14s. 5d.

been made clear. Natal coal is Australia's chief competitor for the Pacific and Indian Ocean export and the local bunker trade. In 1913 the average pit-head price of New South Wales coal was only 1s. 1d. per ton, or 18 per cent. greater than the pit-head price in Natal. To-day the Australian price is 9s. 11d. per ton, or 131 per cent., greater than that of Natal.[42]

Moreover, comparing prices in 1913, 1921 and 1928, coal is now relatively much dearer than other commodities, both in New South Wales and the Commonwealth generally. The increase in the general average of all wholesale prices in New South Wales between 1913 and 1928 was 59 per cent., and in the Melbourne wholesale price index 66 per cent.; whereas that of coal was over 127 per cent. The period from 1920 has, of course, greater significance. In 1921 the New South Wales wholesale price index was 1956 (with 1911 as the base year at 1000), but in 1928 it was 1802; the Melbourne index 1903 and 1808 respectively. Against these decreases are to be put the increases in f.o.b. coal prices of 20 per cent. An impartial analysis of the trend of costs in the production and marketing of coal leaves no doubt about the uneconomic level which they have been reaching since the crash of general prices in 1921. The forces working on the prices of commodities in general have had their origin in price movements abroad; in other words, have obeyed the competitive law of conformity to the general trade cycle. Those working on coal prices in Australia, on the other hand, have had their origin in the power of relative monopoly enjoyed by the coal industry in its connections with other industries of the Commonwealth.

The price dilemma in the coal industry arises from this anomalous situation. All the mine-workers enjoy sufficiently high *rates* of earning and enough proprietors sufficiently big sales to have led everybody in the industry into an economic *cul-de-sac*. From this there can be no escape except by withdrawal either to the open and jostling road of free competition or, to what seems more possible and desirable, a highway with traffic regulated intelligently in the common interest. The monopolies of sectional interests, whether they be of the business enterpriser or of the wage-earner, are always liable to cancel out the advantages of one another if pushed too far. Such cancellation has come in the coal industry. Its coming may, indeed, be read as a symptom of economic disorders gathering in more than one part of the industrial field in Australia. Industrial groups, no less than individuals, are slow to realise the paradox of hedonism. The self-regarding motives are false guides to the goal of industrial stability and happiness. By prompting action which consolidates sectional advantage they have only lip-service to offer to the common good.

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[42] Viz., 1913, Natal 6s. 2d., N.S.W. 7s. 3d.; 1927, Natal 7s. 7d., N.S.W. 17s. 6d. (Natal figures from "South African Year Book," N.S.W., figures from "N.S.W. Year Book.")

PART III.

THE SOLUTION OF THE PROBLEMS.

CHAPTER X.

THE APPROACH TO THE PROBLEMS.

The problem of coal in Australia is a complex of many particular difficulties. Not only do forces external to the industry itself blanch the rosy hopes of the coal entrepreneur and threaten the living standards of the mine-worker. Disunity within is the enemy to the peace upon which can alone be built a stable prosperity, external menace notwithstanding. Irrational acts and attitudes thwart the good which might come of rational management and more scientific technique. A too willing belief in the virtues of free enterprise and a subordination of national to State ideals of self-sufficiency make Australian coal exploitation wasteful of energy and resources and create a baffling problem of over-capacity. The whole situation is an impasse of frustrated wills. It cannot but engage the scientific interest of psychologist and economist and call for the active intervention of statesmanship.

Plans for the resolution of the coal dilemma, if they are to provide real solutions, must start with the recognition that all the problems are linked indissolubly together. Each, however, may have its own appropriate approach. There is a road which must be travelled by the spiritual guide who will touch hearts and wills to acceptance of unselfishness and service as the only ideals worth pursuing. There is a road for the educationist who will teach employer and employee the forbearance which should grow from a knowledge of their own and one another's psychology; and another for the educationist who will make plain the laws of economic health. There are roads along which the business leader and the workers' leader may bring gifts of reorganising ability and moral courage to do the unpopular thing. And, despite its perils, there is still the road for influence and discretionary use of power by the State itself.

It need not be expected of solutions that they should be simple or infallible. Some of the problems have outworks which should not be difficult to demolish with relative quickness. Such are the problems of technique in the mines, of equipment for production, of the overlap of marketing services. Others will put up a more stubborn resistance. Chief among these is the problem of price. The citadel positions are held by the problem of mental attitudes and the problem of the industry's overcapacity. Only a slow and patient use of the methods of education will solve the former and only heroic reorganisation measures the latter.

Classification of possible solutions may be made according to the nature of the problems to which they are directed. But the simplest classification is one that distinguishes proposals for the present from proposals for the future, and it is with this distinction that discussion in the two following chapters will be concerned. It should be obvious that immediate and ultimate needs of the industry will in many particulars be identical or coalesce. Nor should it be less clear that proposals for present or future will have to be concerned with the non-economic as well as the more narrowly economic factors which condition the industry and infuse it with its contrarieties. What, however, is not so clear, but equally necessary to hold in mind, is the Marshallian dictum that "in economics neither those effects of known causes nor those causes of known effects that are most patent are generally the most important." It has been the purpose of the first two parts of this book to show something of the obscurity as well as the variety of causal factors in the present situation. These must be held clearly in view, and their weight and importance properly appraised, in the writing of any remedial prescription, be it intended either to arrest the present sickness or to establish ultimate health.

CHAPTER XI.

THE PROPOSALS FOR THE PRESENT.

I. STABILISATION THROUGH GOVERNMENT ACTION TO REDUCE PRICES.

The non-coincidence of interests among coal proprietors on different fields and on the same field, and the traditional hostility between owners and mine-workers as a whole, with the consequent incapacity of the industry itself to settle its own problems, justify the intervention of the State as leader out of the impasse. It is futile, in the light of experience, to object on vague principle to State intervention, for in no country where the State has withheld its regulative hand[1] has the coal industry resolved its own problems. That State intervention may bring with it elements of positive danger to the health of a great industry is not to be denied. But it is prejudiced thinking based on an elementary fear reaction which identifies intervention with restriction and, in so far as restraint really is involved, restriction with repression. The intervention of the Commonwealth and New South Wales Governments in 1928 with proposals for the stabilisation of the industry had, therefore, at least the justification of necessity. The State Government, which initiated the proposals, felt called upon to act, in the face of the critical situation that had developed, not only as a trustee for the whole community but as a party to the industry through its transport and other services, the Commonwealth Government as the supplementary instrument to what it regarded as a reasonable protection of an Australian industry against the threatening invasion of overseas coal.

Briefly, these proposals were based on the conclusion that the coal industry in New South Wales could only be saved from further demoralisation by action deliberately taken to bring about a substantial reduction in the price of coal. It was proposed that for consumption in New South Wales the reduction should be by not less than 4s. a ton for the product of mines whose large coal was usually sold at the declared price of 25s. at the cranes, Newcastle, and for that portion sold overseas and in the Interstate trade (including bunkers) the reduction should be by 5s. a ton. To effect the 4s. reduction the New South Wales Government proposed that 1s. per ton be conceded by the coal owners from their profits, 1s. by the mine-workers as a reduction in wages cost per ton, and 2s. by the State of New South Wales[2] as equivalent to a reduction in its various service charges. To effect the extra reduction for overseas and Interstate sales, the Commonwealth Government agreed to grant a bounty to the coal consumer of 1s. a ton. The dual arrangement was offered by the two Governments for the experimental period of a year only, and was at first proposed to be applicable only to collieries in the Northern district of New South Wales. It was further proposed by the State Government that, as soon as a reduction in price was made, an authority should be appointed with ample powers to make a full investigation into the industry and "to promote those major reforms essential to the regularisation of supply and to the creation of conditions under which the industry can function efficiently.[3] It is a matter of very recent history that the Northern owners expressed their unenthusiastic willingness and the mine-workers their stubborn unwillingness to accept the scheme and its subsequent modifications.

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[1] Notably in the United States.

As the first concrete plan seriously to be advanced as a means of doing something to restore a measure of health to the coal industry in New South Wales, and as an example of Government intervention, the proposals must be examined carefully. Briefly summarised, the main elements in the proposals may be set out as follows:—

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[2] The State Government reserved to itself the right to re-open the question of the ratio of contribution to the price reduction by the three parties should there be within a year such a revival of trade as to reduce average costs of production per ton.

[3] The Premier of N.S.W. (Mr. Bavin) in his official pronouncement, 14th September, 1928. A Royal Commission, with a very wide scope of enquiry, was appointed conjointly by the Commonwealth and N.S.W. Governments in May, 1929.

(i.) The *aim* was to arrest the decline of sales of coal, both in Australia and overseas.

(ii.) The *instrument* to be used to cause the arrest was a sufficient reduction in selling price.

(iii.) The *procedure* whereby the instrument was to be made effective was: (*a*) Contributions to coal consumers from the Treasuries of the State and Federal Governments; (*b*) concessions by coal proprietors on the price demanded of coal consumers; (*c*) concessions by mine employees on wages earned by them and paid by the proprietors out of the price paid for coal by consumers.

The aim was one admittedly limited to the demands of the critical situation which had developed in 1928. The scheme advanced was an expedient; but any expedient, however temporary, in which there are positive elements to prevent demoralisation in a great industry upon which the livelihood of many thousands is dependent, and which proves an earnest of the entire community's willingness to help, is to be counted an economic and social gain. That aspect needs to be stressed. But to be genuinely sound economically, any expedient adopted in the present must subserve the more important end of stabilising the industry over a period of years. The question how far the 1928 proposals would meet this test is not one of merely academic interest, but has a very practical significance.

The major elements which earlier chapters of this book have shown to be contributory to the general instability of the coal industry in Australia may be summarised as follows:—

(i.) The necessary connection between fluctuations in the demand for coal and fluctuations in general business, more especially though not solely those in secondary production.

(ii.) The maintenance of too high a price level associated with uneconomically high costs *over a period of years*, for coal sold both in Australia and overseas.

(iii.) The absence of reliable assurances, because of industrial dissidence, of uninterrupted deliveries both in Australia and overseas.

(iv.) The inevitable displacement of coal by new forms of fuel power, both because of the maintenance of high prices and irrespective of price relatives.

(v.) The growth of over-capacity of the industry to produce coal to meet demand even at its maximum.

It is proper, therefore, that all these factors be kept in view in examining even measures of expediency. What, in other words, is the capacity of such proposals as were made to reduce or prepare the way for reduction of the instability for which these factors are responsible? And what broad questions of economic policy do such proposals raise?

(*a*) *The Helping Hands of State and Commonwealth.*

It is to be assumed that the principle of selecting any long-established industry for favourable treatment by way of subsidy from public funds is open to grave question on several grounds. A subsidy for such an industry does not have the justification of a needed protection for industries in their infant stages. Even though in fact a subsidy be given to coal consumers rather than to those engaged in the coal industry, there is involved an unequal discrimination between different sections of the public. There is the strong likelihood that that section of the public which purchases coal in large quantities for industrial purposes may appropriate most of the advantage given from the public purse. Moreover, the granting of a subsidy from Federal funds[4] in Australia, although made available in respect of coal sent overseas from any State or to any State from any other, is a virtual discrimination in favour of New South Wales. The coal industries in other States must, of course, justify themselves economically in the face of any future lowering of the price of New South Wales coal. It is rather on grounds of the political theory on which the Federation is built that the allocation from the Federal Treasury of a bounty to virtually one State alone can be questioned, more particularly in view of the heavy investment of public moneys in the black and brown coal industries of Victoria.

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[4] The Federal Government twice offered and twice withdrew its offer of a bounty between September, 1928, and April, 1929. The Government at no time would give favourable consideration to a tariff duty on coal, as suggested by both owners' and mine-workers' representatives.

As, however, the proposed scheme contemplated a subsidy from Federal and State funds *for a limited period only* and, as far as the State contribution was concerned, as a recognition that increases in recent years for State services[5] and in State royalties had served to embarrass the industry, these objections raised on principle lose some of their force. As a temporary expedient, Government contributions to stabilisation may be considered justified. Unless, however, both Federal and State Governments were very specific on the temporary nature of their aid, there was danger of creating expectations of its renewal.

(*b*) *The Condition of Reduced Profits.*

To the extent to which the New South Wales Government's investigation in 1928 into the range of profits per ton on the three main fields of the State may be taken as a reliable guide,[6] two inferences may reasonably be made. A concession of more than 1s. a ton from the owner's gross margins as they were in that year would have made the majority of mines not worth the operating,[7] anything less than 1s. would have been no substantial contribution to price reduction. With profit per ton *averaging* something under 2s., it is obvious that individual collieries on all fields could have made the sacrifice entailed with unequal ability. A few would still have been left with a substantial margin; others, not necessarily those with small operations, would have been left with less than a clear shilling profit or with none at all. There were adequate reasons, therefore, for an unenthusiastic reception of the scheme among coal-owners. On the assumption that total sales of New South Wales coal in 1929 would do no more than recover their 1927 volume[8] by virtue of the proposed price reduction, the total contribution from profits would have had to be upwards of £500,000.

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[5] Railway, craneage and harbourage charges.

[6] As pointed out in Chapter IX., the Government took as complete measures as possible to verify the accuracy of the data submitted. It was the refusal of the mine-workers' organisations to accept these data, and their insistence on a re-investigation in which their representatives or nominee accountants would have access to the proprietors' books, which led to the failure of all negotiations between the owners, mine-workers and the two Governments concerned, and to the eventual decision of the Governments to appoint a Royal Commission, after several abortive conferences, following the closing of the mines of the Northern Collieries' Association and the dismissal of 15,000 mine-workers on 1st March.

Two advantages might have been expected as a result of the concession. The mines in the strongest position, either in their existing profit earnings or in reserves, might, as a result of the operation of the plan, have gained a considerable share of any increased trade, and therefore, through some economies accruing from larger production, not have felt the reduction to the extent to the full shilling. Those in a weak position, on the other hand, would have been forced to justify their existence under conditions of a lowered market price which it would have been necessary to have continued, in the interests of stabilisation at an economic level, after the withdrawal of the Government aid.

(*c*) *The Condition of Lowered Wages Costs.*

The Premier of New South Wales in his public pronouncements and negotiations with the mine-workers' representatives emphasised the equity of concessions by the workers, as well as by the owners and the State, to the scheme of deliberate price reduction. It was patent, however, in the face of the existing distress[9] on the coal fields, that while those mine-workers in steady employment could afford to make a sacrifice there was a large body insufficiently employed or not employed at all, who could only make a sacrifice that entailed grievous hardship, or who could do nothing whatever to ease wages costs. The Government's suggested contribution from the mine-workers to an amount equal in the aggregate to that of the owners was to represent a shilling saved in wages cost on every ton of coal sold, and yet was not to represent an unfair harshness upon the contributing mine-workers. It was left to the mine-workers' representatives to find a formula by which the contribution might fall as lightly as possible upon the lowest paid men. The workers, however, by their mass decisions preferred the rejection of the whole proposal of a contribution from wages, in the trust that light would shine upon some other way out of the darkness gathering over the industry.

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[7] It is to be noted that by adopting the margin available per ton as the measure of profit, the effect of "watering capital" as a means of concealing ratios of profit is eliminated.

[8] Approximately 10,290,000 tons, after allowing for about 7½ per cent. of the gross production (11,126,000 tons), in respect of boiler coal, miner's coal, and dirty coal, being unsaleable. The 1928 gross production fell 1,678,000 tons below that of 1927.

The analysis in Chapter IX. led to the conclusion that labour costs have contributed to the unhealthy economic situation in the coal industry. To bring real earnings for the full number of mine-workers who can reasonably be expected to find regular employment in the industry to an economic level is the problem involved. Whatever is done should recognise the unassailable validity of the economy of high wages. But the situation in 1928 was one full of great and surprising contrasts. Thus, during the year ending in June, about three-quarters of the *miners* on the Maitland field earned on an average over £5 a week, including more than a quarter who earned over £8 a week.[10] Nearly half the *wheelers* averaged over £5 a week, as did nearly one-third of the *daily wage* and *salaried* employees. On the Newcastle field average earnings were probably 25 per cent. lower, and there was little difference between the general average earnings of contract and daily wage workers. Earnings on the Southern field were probably somewhat lower still. Not less than 40 per cent. of *all the workers* in the industry did not average the Industrial Commission's declared basic wage.

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[9] For the relief of which the Government was paying out doles to the extent of £60,000 per annum.

[10] A small number had average earnings for the year as high as £14 a week. All earnings referred to here are gross, i.e., do not exclude costs of explosives to the miners, nor do they include the value of coal supplied to the workers by the owners.

Thus there appears to have been a good case for concessions from wages in accordance with ability to pay. But how apply the principle?

Two sets of questions were involved: Should any concession by the mine-workers be made on *actual earnings* over a period, or on *rates of earnings*, irrespective of time worked? And should such a concession be deducted as a *flat rate* of percentage or as a *graduated rate?*

The objection to the use of rates only as a basis lies in the probability of the incidence of the concession falling heavily on those employees who would still have to face considerable intermittency of work. Actual earnings are a definite measure of capacity to concede a proportion, particularly if earnings over, say, a quarter, are taken as the basis, thus allowing for the effects of some intermittency. On the other hand, the calculation of each employee's concession at the end of a quarter involves a three-monthly refund probably difficult to collect and probably too large an amount to deduct from the pay envelope of the last fortnight. A fair compromise might, therefore, have been a month's actual earnings as the basis and the deduction to be made every alternate fortnight.

The use of a flat rate of percentage from earnings would have had both its advantages and disadvantages: It could be made to apply to *all* actual earnings or to *all above a certain arbitrary minimum;* or two or more flat rates might be applied by discriminating between different classes of labour on the same field or between the same classes of labour on different fields. If, for instance, a 12½ per cent. were deducted from *all* actual earnings, the effect on those whose earnings continue to be small through intermittency would be more harsh than on those whose work is constant. That seems to defeat the principle of concession according to capacity. A flat rate applied to *all above a certain arbitrary minimum,* say 12½ per cent. on all earnings above the equivalent of two weeks' basic wage in a fortnight, involves the assumption that enough mines will get enough orders for coal to enable them to pay wages representing a real reduction in their labour costs. But no such assurance can be predicted. If it were proposed that many "marginal" mines whose employees, because of low actual earnings, would be exempt from making any wage concession should benefit under the proposed scheme, it is certain that the Government contributions would have had to be given without any corresponding reductions in wages costs. In view of the general aim of the scheme to arrest demoralisation, the loss of such unfruitful payment from the Treasury need not be harshly criticised if it could be made a substitute for sustenance doles unrelated to work done. And as actual earnings represent the most desirable, though not necessarily the most simple, basis for a calculation of wage concessions, little would be gained by discriminating either between classes of labour in the mines or as between different fields.

As to the question whether a *flat* or *graduated* rate of percentage to be applied to actual earnings over a minimum would be the more desirable, the advantage of the former is its simplicity of explanation and application. But its disadvantage lies in the still relative inequality of incidence. A 12½ per cent. reduction on the wages of a £5 a week man is harsher than 12½ per cent. on the wages of a £10 a week man. A steepening graduation of the percentage is more scientific. One difficulty involved is that it gets away from the simplicity of a flat rate. Another difficulty arises when the extent of the absolute reduction on the higher earnings becomes an inducement to diminished output. Ideally the graduation should be so arranged that the differences in the increases on the lowest earnings above the minimum (of say £4 5s. a week) are slight, becoming marked in the middle range of earnings (say from £6 to £9 a week), and again slight in the highest range (say over £9 a week). This would ensure that those on the lowest earnings above the minimum would not be hit hard, those on good earnings would still be left with a good margin over the minimum, and those capable of making the highest earnings would not be under an inducement not to put forward their best efforts.

The foregoing detailed discussion of what is involved in a concession from mine-workers' wages is felt by the author to be warranted, in view not only of the insufficient consideration which the hasty rejection of the Government's plan involved, but because in any revival of proposals for a rational reduction of labour costs such considerations would have to be taken into account.

(*d*) *The Instrument of Price Reduction.*

What promise of recovery and stability does a scheme of deliberate action through Government intervention such as has been propounded as a means of bringing down prices really offer? A first observation suggested is that too great reliance should not be placed upon the instrument of price to bring a *speedy* stability to the industry and a *complete* recovery of losses. The reduction proposed in 1928 could probably have been counted upon to win back most of the local, Interstate and overseas trade lost in the previous 12 or 18 months. That could have been expected to ensue from the cyclic recovery of business conditions in the Commonwealth and New Zealand during 1929 and from the extra stimulus to such recovery which cheapened coal for secondary-industry production would give.

But a price reduction of 5s. a ton would clearly take longer to effect a recovery of most of the trade lost over the period 1921 to 1926; a loss of a percentage increasing up to about 24 as between the two years in the total exports from New South Wales, and up to about 50 on that part going overseas. A large proportion of this longer-period loss will probably never be recovered, because of the development of native coals in South America, the Dutch and French East Indies, India, China, and to a lesser extent in New Zealand, and because of the established position of South African coal in the markets hitherto served by Australia. It would be necessary that the 1928 proposals be supplemented by action likely to *keep* the price level lowered over a period of years if those longer-period losses of the past are to be recovered in any substantial way.

The capacity of any such proposal of tri-partite concessions to price reduction by the State, the coal proprietors and the workers to give reliable assurances of uninterrupted deliveries of coal is necessarily conditioned by the acceptance of the plan by the mine employees. Their confidence in the utility of such proposals would have to be won. So far the murk of suspicion and doubt about any necessity at all for concessions from wages has been too strong for the growth of confidence. The mine-workers are naturally cautious, and perhaps right in their caution, for the tendency among employers in times of crisis is to make wages always the first and often the sole objective in the attack upon costs. But even granted that the mine-employees are justified in resisting forces which threaten to lower their living standards, can it be held that there is any justification for nursing stubborn hopes that the industry can be righted without labour costs being lightened and prices pulled down heavily? The mine-workers are also probably justified to an extent in their belief that too much may be made of the virtues of price reduction. But the justification ceases when they deny either that price reduction is the immediate problem of their industry or[11] that the present labour costs are uneconomic. A scheme of deliberate price reductions on the lines of the one proposed may at least serve to win back for the Australian coal industry some of the comparative advantage it should rightly enjoy on its own market and in the markets where it has to meet external competitors. A price reduction enough to do this need not at all imply a price-cutting war in which the mine-workers of Australia will be the unfortunate victims.

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[11] The officials of the Miners' Federation, during the controversy of 1928 and 1929, affirmed that such reduction was necessary, but not at the cost of wage reduction.

Nor is there any need to over-rate the promises of the scheme in this respect. A sufficient reduction in price will not only *keep* the business of South Australian, Victorian and perhaps other State Railways for Australian coal, but will also have the effect of reviving the activities of the iron and steel industries to the extent of giving employment to between two and three thousand industrial workers, including mine-employees, and both directly and indirectly the activities of other secondary industries. This would contribute to the hastening of the upward swing of the cyclic movement to which reference has already been made. The proposals might further arrest the tendency to plant installation requiring forms of fuel power other than coal. A price reduction of 4s. or 5s. a ton for coal would undoubtedly give pause to those manufacturers and others who are contemplating a change-over from coal at present or in the near future; but it is unlikely that equipment already installed for the use of oil or electrical power would be "scrapped" for some time to come, if at all. The effect of a price reduction in coal in arresting the invasion of the substitute, in other words, is not likely to be immediate.

A drastic price reduction perpetuated at the end of a period of temporary help from Government would obviously eliminate many mines at present contributing by their intermittent work to the over-capacity of the industry as a whole. The Government scheme really relies upon the self-interest of the mines most successful in engrossing trade during the period of the subsidies to keep prices low later. But a hindrance to this process may in the meantime result from the twelve months' survival given to some mines destined sooner or later to close. From the viewpoint of ultimate stabilisation of the industry, subsidies are a positive incentive to the maintenance of over capacity. This may not be a bad thing for the period of temporary help, if some of the "marginal" mines can be stimulated under such a scheme to more efficient working and better marketing, and so by the efforts of their managements be brought into the class which may be described as "worthy to survive."

In short, the only scheme yet to be offered for stabilisation of the coal industry through Government action to reduce price represented a generous offer of the community to "help a lame dog over a stile, in the hope that once on the other side he would pursue his way with regaining strength."[12] It was a recognition that the trend of years had in 1928 gathered a momentum that was becoming calamitous, and threatened to become still more so, to thousands of families dependent upon the sales of coal for their living. It was a recognition, further, that the losses in the trade in coal to competitors overseas must mean the forfeiture of wealth to the nation as a whole and a possibly avoidable contribution to the distresses of other industries in Australia. It was to be judged not by impossible expectations that it would do more than give all concerned in the coal industry a brief period of respite in which to set about putting their house in order. The Government scheme was not intended to eradicate the main evils of the industry, but to give a decisive lead at a time when little else but mutual recrimination was proffered by the industry itself.

The mine-workers in their rejection of the lead offered showed all too much of the common confusion between the meaning of nominal and real wage levels. The collective will of the miner is frequently invoked in such a way as to become a strait-jacket cramping the free operation and expression of his collective mind. This seems inevitable in the nature of decision-making on the coal fields. It is part of the price democracy pays in depending for the solution of its economic problems upon the instinctive fears of the mass meeting. The mass is not always wrong; neither is it always right. The present impasse suggests that collective fears and suspicions may yet be so fanned and the collective will so hardened that the rational qualities in the collective mind may get small chance of doing the service of which they are capable. The mine-workers, to say the least, showed poor strategy in holding to an indefensible position when withdrawal to and consolidation upon a line of much less real loss was possible and whence real advance could eventually be made.

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[12] From an article by the author on "The Coal Impasse" ("Sydney Morning Herald," 28th January, 1929.)

II. Stabilisation Through Government Action to Reduce Dissidence.

The attack upon the network of coal problems by the way of price stands for immediate action upon an immediate problem. Is a similarly direct move possible at present to mitigate or remove the dissident spirit within the industry? What part can Government leadership take in such a move?

There are those in the coal industry, both in the ranks of owners and men, who regard the intervention of Government with its arbitration machinery as a frustration to be swept aside at the earliest moment. Owners who hold this view oppose the compulsory arbitration system, not only on the ground that it has prevented ordinary economic forces from keeping costs on an economic level, but because it has intensified rather than mitigated the disputatious spirit. Men in the ranks of the mine-workers who oppose the existing Tribunal either do so on grounds of dissatisfaction with its inadequacy of arbitrators or with its findings, or on grounds of doctrinaire preference for the "direct action" of class warfare. The attitude of the class war doctrinaires is by no means representative of opinion among the mass of mine-workers or among all the officials of the Miners' Federation;[13] but it is questionable whether mass opinion is strongly in favour of committing the Federation to a policy of peace. The attitude of owners is that Government can best show its leadership by withdrawing the compulsory arbitration machinery in favour of a reversion to round-table conciliation between themselves and the men.

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[13] See, e.g., the statement of the General Secretary (Mr. D. J. Davies) in support of the proposed Peace in Industry Conference, "Labour Daily," 10th March, 1928.

(*a*) *The Jettisoning of the Coal Tribunal.*

It is true that resort to compulsory arbitration machinery has had little marked effect in preventing sectional stoppages, whatever good services it may have rendered in eventually making workable decisions as to basic rates and conditions. But the question may justifiably be raised whether the existing Coal Tribunal can be held responsible in itself for the thousand and one disagreements likely to arise in particular collieries either out of conflicting interpretations of the meaning of its awards in relation to specific situations, or out of the conflict of mental attitudes with which it has nothing to do. It may further be asked what other alternative machinery might be substituted to establish those broad common rules by which modern opinion insists that industrial relations shall be governed.

Reversion to the jurisdiction of the Commonwealth Arbitration Court promises no better way out of dissidence. For precisely the same types of objection are levelled against the Court by employers and employees generally as are urged against the Coal Tribunal by opinion among the parties to it. Not an employers' organisation in Australia but what at some time or other has recorded its dissatisfaction with the results of the compulsory arbitration system; and one of the most recent decisions[14] of the Australasian Council of Trade Unions to use the boycott against the Federal Court as a protest against an award increasing the working week in one industry from 44 to 48 hours is indicative not of unanimous[15] but at least of representative trade union opinion. It is clear that the Federal Parliament would contribute little or nothing to the solution of the problem of disputes in coal mining merely by repealing the Industrial Peace Acts of 1920.

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[14] February, 1929.

[15] The A.W.U., e.g., declined to associate itself with the boycott, and affirmed its adherence to the Arbitration system. Following the decision of the Bruce-Page Government in May, that the Commonwealth should withdraw from almost the entire field of compulsory arbitration in favour of the States, the Federal Unions affiliated with the A.C.T.U. have swung round in strong defence of Commonwealth arbitration.

Coal owners collectively have not been specific about the type of machinery with which they would replace the Tribunal. The mine-workers, on the other hand, have in convention assembled[16] recently declared themselves in favour of rejection of the Tribunal and of substitution of "pit-top conciliation and direct action." How far this decision is truly representative of the mass of inarticulate opinion among the workers in the industry is not clear, for the resolution was much less the outcome of careful consideration in the lodges than of the persuasiveness of delegates of the militant minority movement. The coupling of "direct action" and "conciliation" in a policy in which emphasis is loaded on the former rather than the latter suggests little likelihood of peace as an expected fruit. The spirit which produced the decision was, unfortunately, precisely the spirit which needs to be exorcised. Such formal commitments to policy are among the difficulties which so frequently render impossible the free interchange of thought on common problems between employers and employees in their industrial relations. It is hardly to be expected that, even if pit-top conciliation[17] had much to commend it as a substitute for the Coal Tribunal, employers would show much willingness to accept it only as a *pis aller* of the workers.

Fortunately, not all the miners are as bad as their formal creeds. The absence of any marked enthusiasm for a policy of intransigent militancy is a condition still leaving the way open for consideration of ways and means to engender a truly conciliatory approach to questions on which men and managements differ. The view expressed by not a few in the Federation ranks that the Tribunal needs supplementing rather than supplanting suggests that constructive minds are at work. Their view, indeed, appears to be the one most correctly expressive of the real requirements of the situation.

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[16] At Sydney in June, 1928.

[17] Mr. Justice Campbell, in his Second (Final) Report, 1920, made a similar recommendation of Conciliation or Disputes Committees under the sanction of law for each colliery, "to whom, failing agreement between the parties directly interested, all questions in dispute affecting working conditions at the colliery should be referred, so that adjustment of these disputes may be effected as far as possible by negotiation and agreement."

(*b*) *Conciliation on the American Model.*

To jettison the Coal Tribunal in favour of an unworkable plan of conciliation between irreconcilable parties is to invite futility. Clearly no machinery can change the hearts of men to whom conciliation has no comeliness that it should be desired. A positive belief in the peaceful achievement of justice out of conflicting conceptions of rights is a necessary preliminary. Given this condition, the supplementing of the functions of the existing Tribunal with almost *any* kind of local machinery for discussion and decision upon points of disagreement is as much as can be hoped for the elimination of sectional disputes.

In yet another way, however, might the work of the Tribunal be supplemented without being supplanted, at any rate in the entirety of its functions. The degree to which the supplementary machinery could successfully usurp the functions of the Tribunal might, indeed, be the very measure of its success. There is no serious reason why the machinery of conciliation operating in the United States coal industry might not with discrimination be adapted to Australian conditions. Arbitration has never been popular among American coal "operators" and their employees, and from as far back as 1886 the machinery of periodical joint conferences has been the main method of establishing agreements fixing common rules over the unionised fields.[18] In the United States the Interstate Joint Conference is "the parliament of the coal industry."[19] The valuable features of this Joint Conference[20] are not so much the basis of representation (independent as well as associated coal proprietors meeting with popularly elected representatives of the United Mine Workers), but the equalising of the voting power of the two sides, the requirement of a unanimous vote on all questions affecting wage scales and agreements, and the procedure leading either to unanimity or the automatic "suspension" of work in the mines. "Under the rules of the Conference, the operators from each of the four States[21] have four votes and the miners from each State have four votes, irrespective of the number of representatives each State may have present."[22] The purpose of this provision is to prevent any coalition of interests in a single State to impose unwanted conditions on any other State. This end is further guaranteed by the requirement that each State vote as a unit, the unit vote being determined by a majority of the individuals representing the State. But any *final* decision of the Conference must be a unanimous vote of *all* the States.

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[18] "Experience taught both parties that conciliation and compromise between representatives of equal power was a more acceptable working principle to govern the making of agreements than arbitration by outsiders."—A. E. Suffern: "The Coal Miners' Struggle for Industrial Status," p. 189.

[19] I. Lubin: "Miners' Wages and the Cost of Coal," p. 56.

[20] Which is supplemented by District and Sub-district Conferences for agreement on matters not specially national.

The discussions leading up to such unanimity, if achieved, are inevitably protracted. But it is the understood thing that they must lead either to that end or to a general strike in the industry. The desire to avoid such a costly impasse to all concerned nearly always produces a working agreement for a period of two or three years. It is the *procedure* for the avoidance of impasse which has most significance. After preliminary discussion by the full conference and a clearing of the grounds of dissatisfaction with the provisions of the previous agreement,[23] the conflicting demands are referred to a small committee of sixteen members from the owners and sixteen from the mine-workers.[24] This is known as the scale-committee. At times it cannot provide a solution in its deliberations and appoints a sub-committee, which, because of its smaller members, may be able to reach a compromise. In the full committee "each individual recognises that he is talking for publication"; but in the small sub-committee, of which no reports are kept, "a few men speaking with utmost freedom soon find out what each side will give and take."[25] As the agreement reached by the sub-committee practically commits the full committee and is generally endorsed by the full Conference, it will be realised that the American machinery is capable of a combination of democratic representation, free ventilation of opinion, and businesslike decisiveness. On the rare occasions when even the sub-committee cannot agree, the scale-committee adjourns, and a "suspension" of work in the mines takes place on April 1, the day following the expiration of the former agreement.

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[21] Comprising the Central Competitive Field.

[22] Lubin, op. cit., pp. 57 and 58.

[23] This has been described as a "method of mutual education." (Suffern, op. cit., p. 204.)

[24] Four from each of the two sides in each State.

Here is a working model of conciliation which owners and men in the Australian coal industry might carefully consider. The detailed workings of the American system cannot be discussed at length in this book; but the available literature[26] elsewhere is fully explanatory, critical and thorough. A national conference, with perhaps district counterparts, meeting periodically as an accepted part of the organisation of the coal industry, might prove, if its procedure were comparable to that of the American Interstate Joint Conference, to be a far more serviceable means of ventilating the opposing viewpoints in the industry than either the *ad hoc* compulsory conferences convened by Government when the fight is already on or the quasi-court procedure of the Tribunal when called upon to intervene. The adaptation of the American way need not, however, imply in Australia the complete renunciation of the compulsory arbitration machinery. The American method still leaves stalemate a real possibility. In Australia the Coal Tribunal could well be retained, not only to exercise its present conciliatory office and to be the official channel for registering the agreements of National and District Conferences, but to be the final tribunal of appeal and legal sanctions when the thorough-going and patient discussions of the Conferences had failed.

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[25] Suffern, p. cit, p. 205.

[26] Notably the volumes of Arthur E. Suffern and Isador Lubin, both published by the Institute of Economics (The Macmillan Coy., N.Y.).

CHAPTER XII.

THE PROPOSALS FOR THE FUTURE.

I. THE WAY OF IMPROVED TECHNIQUE.

What promise of solution of problems of the coal industry lies along the road of better technique? Obviously any bettering of technical processes is not a matter of a few months or of a year, but of a period of years. It is among the long-range solutions rather than among those capable of immediate trial that the question of technology must be considered.

It is sufficiently clear from the discussion in Chapter III. that on comparison with black coal mining practices in other countries the Australian industry lags behind the best, even though its productive performance stands very high. In brown coal practice Australia marches abreast of the best. Were the Commonwealth completely isolated from the influences of improving technique in other countries, the record already achieved in black coal might be a cause of satisfaction. But the adoption already of the most economical mining practices by those countries in appreciable rivalry[1] with the Commonwealth suggests that on national grounds the question of improved colliery technique is extremely important. Australia cannot hope that the quality of her coals for export can alone shoulder the burden of maintaining a comparative advantage over rivals. Sufficient has already been said to indicate how this advantage may be lost through neglect of other important factors, and not the least of these is the necessity of being in the van of technical progress.

If we turn, however, to the question how far the betterment of technique will contribute to solution of the internal difficulties of the industry, we face a puzzling paradox. Two obvious results must proceed from a greater mechanising of mining. The first is a saving of labour for a given quantum of coal won; the second an increase in the productive capacity of existing collieries and of each coal face within particular mines. On purely economic grounds the displacement of mine-workers, distressing and difficult as it would have to be over a period of years, is not to be condemned; though for social reasons it would be tragic if the process were not hastened slowly. But again on economic grounds it might well be asked whether a move to greater mechanisation which intensified an existing over capacity to produce would by itself do anything but perpetuate the dilemma at the heart of the coal problem. Even with a labour force much attenuated there would remain an overplus of equipment still capable of more than serving the market with its requirements.

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[1] Notably South Africa and China. See Chapter VI.

That is the paradox. It is inconceivable, of course, that improved technique productive of improved capacity would be embraced by all mines alike or by all together. That might suggest the elimination of laggards in the race for efficiency and a hastening of the time of balanced adjustment between productive capacity in the industry as a whole and the market's ability to absorb coal. True it may be that the more enterprising will gain a survival value not accorded to those who perish. But there is no sure guarantee in that fact that the band of survivors, if left to compete, will not have pushed the development of their own aggregate capacity to the old limits of excess. Experience in the land where the mechanical processes of coal mining have gone farthest suggests that new problems attend the path of the "upright in technical matters." "The beginning of the dominance of overhead," write two investigators[2] into the problem of American coal, "lies in the innocence or the guile of the operator who decides to bring his mine up-to-date. Whether he aims at an increase in possible output, or has it thrust upon him unawares, he finds himself possessed of 'more mine' than he is used to. . . . Under the older system,

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2. Walton H. Hamilton and Helen R. Wright in "The Case of Bituminous Coal" (Institute of Economics Series), pp. 174, 175.

where the bulk of expenses were direct, the spasmodic character of work was not of the most serious consequence in the balance-sheet. Under the new system, 'overhead costs' have come to demand an end of interruptions. Interest must be paid on equipment whether it is used or not; a complex organisation must be kept intact or no ton of coal can move; technicians and petty bosses are paid by the month and miners become 'company men' to be paid by the day. The tendency is to make the operation so routine in character that whether the machine-miner is paid by the day or by the ton is a matter of indifference. An interruption due to a machine unable to do its work, a process not going smoothly, a break in the correlation of tasks, and 'overhead' still refuses to take time off. The annihilation of this excess of capacity within his mine becomes the prime object of the manager's endeavour."

Whether, then, from the viewpoint of the individual colliery management or of the industry as a whole, the mechanising of coal mining is likely to have a very doubtful contribution to make to the solution of what we have called the central problem of over-capacity. Does, however, that other phase of technology lying more definitely within the scope of applied chemistry offer a better promise? Physical scientists and engineers are working assiduously the world over to find the ways by which the many hundreds of millions of raw coal burned annually may be made to render a less wasteful service to humanity. Their general problem is as much economic as it is technical. Victory over market difficulties, however, is still to be achieved by the numerous processes for commercial production of liquid and solid residual fuels from coals of various grades[3] and by raw coal or carbonization residual fuel in pulverised form. Where geographical location of plants for certain of these processes, or their association with metallurgical and chemical industries, has been favourable, a measure of commercial success has been won. But the difficulties of transport costs and of profitable disposal of by-products from processes which have as their main objective the disposal of fuel on a *general* market[4] have hindered their successful development on a big scale.

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[3] By the four general methods of (i.) high-temperature carbonization, (ii.) low-temperature carbonisation, (iii.) hydrogenation, and (iv.) synthetic manufacture by the reduction of carbon monoxide.

In Australia, as elsewhere, successful extraction of motor spirit from coal tar and retort gases has been associated with iron and steel production.[5] The spirit so won, however, is gained as a by-product, not as a main product in the treatment of coal. It is obvious that without the ready and continuous disposal of the large quantity of metallurgical coke which is itself the main product, and which is needed for the business of iron and steel production, the costs of producing benzol alone would be prohibitive. The selling price of petroleum oil products consumed in Australia, all of which are imported, is still sufficiently low to render the extraction of motor spirits from coal as a major industrial activity in itself an uneconomic undertaking.[6] There is still the possibility, however, that the threatened rise of petroleum spirit prices, as the world's known store of free oil becomes rapidly depleted, combined with the cheapening of coal oil by the newer processes, may yet swing the balance in favour of coal; but such a favourable conjuncture is not yet within a decade's sight.

More hope for coal is being felt in the possibilities of pulverised raw fuel for use in the furnaces both of ships and industrial plants. It is hoped that the relative cheapness of powdered low grade coals or the "slack" of even the best grades, which may be fed to furnaces with at least the same convenience as crude petroleum oil, will yet induce the shipping company and the industrialist either to revert to or keep to the use of coal. Unhappily,

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4. This is the economic problem of joint-supply.

5. At the Broken Hill Pty. Coy.'s steel works at Newcastle, where, under normal conditions, some 3,500 gallons of benzol are recovered every 24 hours, from gases and tar resulting from a weekly production of about 7,000 tons of metallurgical coke.

6. "We have spent thousands of pounds in experimenting in regard to by-products, and we have found that, under the conditions existing here, by-products cannot be profitably handled. . . . Where is our market for the particular commodities which we might produce from the treatment of coal?"—Mr. C. M. McDonald, Chairman, Northern Collieries' Association, "Sydney Morning Herald," 25th January, 1929.

there is a serious hindrance to the extensive use of pulverised fuel in the old problem of transport costs. Coal in pulverised form is exceedingly liable to spontaneous combustion unless kept in some kind of air-tight container. For that reason its transportation either by rail or in ships' bunkers implies heavy costs of special carrying equipment, which represent an initial barrier to its popular use. The number of industrial plants in Australia at present burning pulverised fuel may be counted on the fingers of one hand, and in each case the pulverisation takes place *within* the plant *after* the delivery of the coal in solid form. In so far as the use of pulverised fuel in Australia has to depend on the transportation of heavy loadings of raw coal, whether in large lumps or as "slack," transport costs are likely to be an insuperable barrier to its extensive adoption.[7]

All the experiments to which we have referred represent the counter-attack of coal upon the substitute. It is well, for the sake of many thousands dependent upon the exploitation of a rich and abundant natural resource in Australia, to be optimistic about the result; but, with the odds still weighted heavily in favour of the invading substitute, it is equally well that no disappointing expectations be created. Coal is probably destined to recover its supremacy in a future still sufficiently afar off to render the interim a period of difficult economic adjustments and unavoidable distresses.

II. The Way of Amalgamation.

Is the coal industry amenable to such improvements in its economic organisation as to find thereby a way of escape from its embarrassments?

Critics both outside and within the industry find grounds for fault-finding with certain general features of organisation, but defence of things as they are is seldom wanting when defects are particularised. Most of the criticism from within the ranks of the industry proper is directed against the services of coal handling after it leaves the mines rather than against organisation of the more purely productive operations. External criticism is prone to take the view that the industry as a whole exhibits insufficient "rationalisation" of procedure right from the coal face to the consumer.

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[7] In Germany it is a common practice in smaller plants to effect the pulverisation, not at the place of consumption, but at a briquette works from which it is conveyed in specially constructed railway waggons. There are possibilities of similar developments in Victoria, only if possible consumers of dried and powdered brown coal in that State are willing to shoulder the costs of the special railway equipment—which seems unlikely.

From the analysis in Chapter IV. it was seen that both monopolistic and competitive elements exist in the ownership and control of the mines. The element of monopoly, however, lies not in any exclusive controls exercisable by organically unified ownership, but in the association of a relatively small number of distinct mining concerns whose aggregate output of the best available coal predominates in the total production of the Northern fields of New South Wales. The competitive elements lie in the bidding for trade, not only among the members of this associated group who may be pitted against one another, but by the independent unassociated collieries in the same district and by independent and less strongly associated enterprises in other fields and States. That the business aggressiveness of coal producers outside the main group is always something to be reckoned with has been indicated in the effects of the growth of an excess of colliery undertakings upon the coal industry at large; that at times it may become seriously disturbing to the main group is indicated in the appropriation of new business by the independent mines in the critical months of 1928 and 1929.

The question has been raised whether it would not be in the best interests of the industry and of the community at large not that the existing degree of concentrated control in associated groups should be broken down, but that it should be intensified by a process of organic amalgamations. It was the express belief of the British Coal Commission of 1925 that a policy of amalgamation, applied with the requisite discretion, was essential for the return of the prosperity of the coal industry of Great Britain. "But," said the Commission, "there may possibly remain cases where combinations are desirable but where the mine-owners directly concerned show themselves incapable of initiative"; and the subsequent Act[8] based on the Commission's recommendations gave the Mines Department the power to compel amalgamation until time had been given to show how far private initiative would prove adequate. The White Paper presented to the House of Commons in November, 1928, showed that during the two years following the passing of the Act, and during which the official powers of coercion were kept "in the background," the movement to voluntary amalgamation among British Colliery interests was by no means noteworthy enough to arouse enthusiasm about its success. So far, schemes of amalgamation embracing pits employing only 15 per cent. of the mine-workers of the country have eventuated.[9]

It is probable that at least as much conservatism and individualism bar the way to effective amalgamation among Australian colliery interests as among British. Amalgamation has been urged in Great Britain and elsewhere on the evidence of statistics that, speaking generally, as the volume of output of an undertaking rises so financial results improve. It is questionable, however, whether experience under Australian conditions of mining costs convincingly bears out the truth of this generalisation. The large concern with big output does not necessarily show a better record in net margins than the lesser with smaller output. The realisation of this fact is not conducive to a merger movement for unified control of larger aggregate output for its own sake.

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[8] The Mining Industry Act, 1926, under which the Railway and Canal Commission, on a prima facie case being made out, may compel a recalcitrant undertaking to join in a fusion.

[9] "During the two years following the passing of the Act the (Railway and Canal) Commission confirmed only three schemes—two in South Yorkshire and one in South Wales—involving 32 pits, normally employing about 26,000 workers. During the same period fourteen schemes were carried out without reference to the Commission. Seven of these concerned South Wales alone, two were confined to South Yorkshire, and two to West Yorkshire; one involved pits in South Yorkshire and Nottinghamshire, another in South Yorkshire and North Wales, and one in Northumberland. Altogether 140 pits, normally employing 100,000 workers, were concerned in these fourteen schemes. Since the publication of these figures, in November, 1928, other schemes have been brought to completion, perhaps the most notable among them being a Lancashire amalgamation involving 19 pits and over 16,000 workers." ("Midland Bank Monthly Review," March-April, 1929.)

Yet this experience does not dispose of the case for the economies possible in amalgamation. A judicious assembling into amalgamated groups of bigger concerns of large financial influence, yet handicapped by unequally productive mines, with small but efficiently run colliery enterprises might produce decided advantages in the elimination of overhead. An amalgamation of interests should result in the closing down of badly-managed concerns at present allowed to share in the advantages of a price which their very existence tends to keep too high.[10] It should make for economy of administration. Existing companies all have their boards of directors, secretaries, general managers, shipping managers and office staffs. "An examination of the various boards of directors," says one authoritative critic, "discloses the fact that the only unnecessary qualification is a knowledge of coal mining." There are between 30 and 40 such boards in the Northern district alone. Each colliery enterprise has its Newcastle office and staff, and generally a Sydney office in addition. Were companies to amalgamate most of these could be abolished in favour of one Newcastle office to do the whole business. There would be no *prima facie* need of a board of more than three directors to govern the business policy of the amalgamation,[11] aided by one general superintendent (a mining engineer) with a small staff, who could attend to the whole of the industrial and practical side of the undertaking. Apart from a noticeable reduction to be expected in administrative costs, there is to be anticipated the adoption of the best proved practice in all the collieries within the amalgamated control. Any causes leading to unequal performance in the mines should become subject to the correctives of a common supervision. The same unity of supervision should mean a more selective use of a given amount of capital.

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[10] There is reason to believe that the declared selling prices of coal are so determined on costs that if, for instance, of 13 mines subject to higher costs through wage increases, 12 require the recovery of an extra 4s. in price but the thirteenth 5s., the price tends to be increased by 5s. rather than 4s. The economical thing to do is to close down No. 13 mine.

[11] One coal organisation in the United States, with an output of 60,000,000 tons, is run by one board of directors.

Group amalgamations should assure a more general use of colliery rolling stock and storage facilities,[12] and the appropriating of any economies to be gained by standardisation of colliery equipment and in the purchase of colliery stores. Where contiguous mining properties are merged in the one ownership there are the further advantages gained in the saving of boundary coal. And not the least ultimate gain might be a concerted attack upon hydraulic stowing, which need not continue to be the present insurmountable problem, if strong amalgamations could "make one big interest of it."[13]

The foregoing arguments in favour of group amalgamations are not made without recognition of the relatively small proportion of total pit-head costs represented by administrative expenses, and that in the operations of mining enterprises in New South Wales these since 1921 have become a lessening proportion. The organisation of the industry to-day is substantially what it was in 1921, so that any economies effected in costs of administrative, clerical, superintendence and general overhead services since the earlier date are no measure of possible economies under a reorganisation on the lines suggested.

A necessary corollary to group amalgamation, if any real contribution to the solution of the problem of overcapacity is to be made, is the closing down of collieries. Reorganisations following bankruptcies in coal mining have not always produced the desirable sacrifice of equipment represented in the closing of uneconomically worked collieries. Unless reorganisation means the removal of the embarrassing surplus mine, it leaves the situation in an over-developed industry little the better. As to whether there are further dangers in a greater concentration of ownership, which might place the coal consumer more than ever at the mercy of the coal producer, the observation is alone necessary that the present

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[12] See Campbell, Second Report, pp. 10 to 14. Also the author's "A Study in Social Economics: The Hunter River Valley," pp. 137 and 138.

[13] See Q., 27,788, in evidence before Royal Commission, 1925. Also discussion in Chapter III., Section I., of this book.

"consumers' revolt" has been sufficiently real to cause the economies which might follow reorganisation by way of group amalgamations to be reflected in lowered prices.

III. THE PROMISE OF CARTELLIZATION, COLLECTIVE CONTRACTS, NATIONALISATION, A CONSUMERS'-AND-PRODUCERS' CORPORATION, AND FORMS OF SOCIALISATION.

(a) *Cartellization.*

The way of the amalgamation may not be the road of greatest promise for the coal industry. If, indeed, the worn track of *laissez faire* be not after all itself the safest road, what other ways of reorganisation remain?

Granted that a "rationalisation" of the industry is desirable, will it follow from a movement to elaborate the existing "gentlemen's agreements" and selling agencies among associated colliery enterprises in New South Wales into one or other of the forms of cartel operating in the German and British coal industries? What extra advantages, if any, would accrue to the colliery concerns embraced, and what to the community? Cartellization in the coal industry proper and in the co-operation of coal and metallurgical industries has proceeded more elaborately and in more diverse forms in Germany than in any other country; and at least one ramified experiment on the same lines is being tried in Great Britain. In Germany each black coal district has built up its own special organisation, differing in essential features from the others, and the lignite mines have done likewise. Thus in Upper Silesia coal enterprises are united only in a loose price agreement similar to and possibly less effective than that binding the members of the Northern Collieries' Association of New South Wales. Such an agreement is scarcely to be called a cartel proper. In the Ruhr and Lower Silesia, on the other hand, are to be found closely organised coal syndicates with strict regulations governing members, not only in the matter of selling prices but of output quotas and marketing territories. The Rhenish-Westphalian (Ruhr) Coal Syndicate and the Upper Silesian Coal Union are again both closely connected with the great steel industry combines in the marketing of such portion of the latter's coal as is sold. All these steel combines, and notably the largest of them all, the Vereinigte Stahlwerke,[14] possess enough coal resources of their own to render them independent of purchases from the purely commercial coal organisations. But as sellers of coal they are an integral part of the two most important coal cartels, to such a degree that their association with the Ruhr Coal Syndicate unites the Rhenish and Westphalian industries into an intricate single organism. The Rhenish Brown Coal Briquette Syndicate, again, which is an even more closely-knit organisation than the Ruhr black coal cartel, gives its members greater independence in wholesale trade; and the Central German brown coal syndicate, despite the compulsion which the State brings upon brown coal enterprises to join, is little more than a statistical and administrative office with no selling machinery.[15] Thus there is much diversity of form and affiliation with metallurgical operations in the German coal cartels.

Only three organisations of any note unite coal operators in Great Britain in a similar way. Two of these, one in Scotland[16] and the other in South Wales, represent nothing more than price associations.[17] The Central

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[14] Formed in May, 1926 by the union of the Rhine-Elbe Union, the Thyssen Group, the Phœnix Group, and the Rheinische-Stahlwerke. At the time of its formation this giant organisation had 151 coal shafts of its own, which produced 23,000,000 tons of coal in 1925, and 14 smelting works, with 63 blast furnaces. Its coal extraction is about 22 per cent. of the total output of the Ruhr. (See the illuminating article of Dr. M. Schlenker in the "Manchester Guardian Commercial," July 19, 1928.)

[15] Dr. K. Wiedenfeld: "Cartels and Combines." (League of Nations' Document C.E.C.P. 57 (1), Economic and Financial Section.)

[16] The Scottish scheme, inaugurated in March, 1928, provided for a general levy among mines responsible for 90 per cent. of the Scottish output on coal sold for inland purposes, with a special levy on sales for particular classes of consumers. From the fund so raised compensation was paid to collieries suspending or curtailing operations. A revision of the scheme now contemplated (June, 1929) abandons the principle of closing collieries, and substitutes quotas covering the whole of the Scottish collieries as far as inland sales are concerned, while leaving export sales uncontrolled. The levy will compensate collieries for withholding an export surplus from the inland market, thus raising and maintaining home prices.

[17] The South Wales scheme originally contemplated the additional features of a levy of 3d. per ton for the establishing of a fund for the compensation of members unable to get trade at the fixed price, and a penalty of 2s. a ton for all coal sold below the fixed price. These features, however, have never come into actual being. The scheme is being worked on a purely voluntary basis.

Collieries Commercial Association, commonly known as the "Five Counties Scheme,"[18] which is an export organisation, more nearly resembles the closer-knit pattern of some of the German cartels. Its aims have been to stimulate coal exports from the districts concerned by means of a 4s. bounty per ton, paid for by a levy of 3d. a ton on total output, and to restrict production by means of a quota.

The relevancy of these brief descriptions of cartellization in Germany and the United Kingdom lies in what they may suggest for the Australian coal trade. Does any success they may have achieved in reaching their objectives hint at a possible adaptation to Australian conditions? Have they, first of all, any contribution to offer in the stabilising of relations between productive capacity and the market's power to absorb coal? As far as Germany is concerned, there is evidence that cartellization has by no means satisfactorily solved this problem. Despite the fact that there is a unified control of home prices under the supreme authority of the Reich Coal Council (established by the Reich Coal Law), the several cartels themselves compete fiercely for markets,[19] are "riddled with internal dissensions," and are "constantly threatened with disintegration."[20] The divergence of interests between colliery concerns pure and simple and those associated with smelting and steel works, and between the most and the least productive coal enterprises, has never been overcome. Cartellization in itself has not eliminated the surplus mines. This process, as far as it has gone, has been left to the action of the larger undertakings, which have absorbed the smaller.[21] It is to be inferred that the price paid for coal by the German consumer still includes a sustenance element for unneeded collieries.

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[18] Embracing collieries in Yorkshire, Lancashire, Notts, Derbyshire, and Leicestershire, and operating first in April, 1928. The coal districts of Cheshire, Cannock Chase, North Staffordshire, and Warwickshire, however, have since been embraced in the scheme. Ninety per cent. of the coal in all the districts concerned, or a yearly production of over 100 million tons, or two-fifths of the total British output, is under control in this comprehensive scheme.

[19] Notably in the "area of competition" which, because of its seaboard situation, is open to the access of British and other foreign coals.

[20] Dr. K. Wiedenfeld.

[21] Thus, whereas in 1893, the date of the creation of the Ruhr syndicate, the maximum output of any one concern was 3,000,000 tons, to-day the maximum, excluding the Vereinigte Stahlwerke, is about 10,000,000 tons.

The "Five Counties Scheme" in England has been credited with some success from the viewpoint of the collieries concerned. The scheme, however, has been open to the weakness of permitting an unnecessary swelling of the exporter's profits. The expectation that the export levy would be more than recouped from higher prices paid by public utility consumers at home has not been realised. The effect of the quota system has been not only to restrict output, but to drive up costs. Moreover, the only advantage so far apparent is a local, not a national one. The undoubted increase of export trade of the Humber ports[22] has not been a gain at the expense of competing countries, but of other British coal exporting districts. The Scottish scheme, on the other hand, has not solved the problem of over-capacity.

Thus it is apparent that an elaboration of the existing coal associations and central selling agencies in Australia in imitation of European models, either by building up of bigger membership with enterprises as yet independent or by the adoption of the quota system of restricted output, would have little to contribute to the solution of the Australian problem. No economical closing of unneeded pits might be expected, nor could the cartels expect any recoupment from prices in Australia for concessions in prices made overseas.

(*b*) *Collective Contracts.*

Along quite other lines proposals are being advanced, and, indeed, experiments conducted, for attack upon the problem more particularly of costs incidental to industrial disputes. This is the plan of collective contracts. Briefly it implies a new relationship between the mineworkers and the colliery owners. The new plan involves the formation of all the employees in a mine, including the office staff, into a company to contract collectively with the owners to win and place all coal in the colliery waggons or at other points for collection for a stipulated price per ton.

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[22] An increase of 90 per cent. as between August, 1927, and August, 1928. ("Manchester Guardian Commercial," 30th August, 1928.)

Already two experiments on these lines have been tried in Australia, one at the Catamaran Colliery in Southern Tasmania, and the other at the Balmain Colliery, Sydney, in New South Wales. In both cases the hitherto existing labour conditions made productive operations unprofitable to the owners. At Catamaran the owning company found that it could not make a profit on the hewing rate, and so closed the mine. The representatives of the miners' lodge then entered into the arrangement with the company whereby the latter agreed to pay the men collectively at the rate of 20s. a ton for run-of-mine coal. Inability to dispose of the "slack" coal, however, which represented about half the tonnage output, led to a revised arrangement whereby the company agreed to pay 23s. a ton and to take 10 per cent. of the "slack." But the remaining 90 per cent. still remained to embarrass the mine-workers, who succeeded in having the price raised to 23s. 9d., with the condition that all "slack" be left in the mine. Even so, the miners could not make wages on this price. Their demand for 28s. a ton, without slack, was rejected by the owners, and once more the mine was closed down. Thus the first experiment in collective contracting came to grief on the rocks of costs.

The Balmain experiment has so far been more fortunate. Here the existing owning company was reorganised, and entered into a contract with the executive committees of the Balmain coal miners' lodge and the Central Council of the Miners' Federation. The collective interests of the men were to be represented by a company, known as the Balmain Coal Contracting Company Ltd., formed by themselves, with each member taking out a 5s. share. The contracting company, as with the Catamaran miners, appointed its own mine manager. It agreed to raise coal and place it "in ship," "on lorry" or "in bins" at a definite price for a term of years, with the proviso that, should the selling price of

Southern coal fall, there would be a *pro rata* reduction in the price payable to the contracting (miners') company. So far the scheme has operated with success for both parties. The contracting mine-workers have almost unbroken work, are paid the ordinary hewing and wage rates, and are accumulating a reserve of profit which will presumably be shared as a bonus. Already their own management has pruned away unnecessary labour, with a consequent improvement of the ratio of men at the coal face to off-hand and surface labour and a saving in labour costs of round about 5s. a ton. No serious difficulties have disturbed the men's own management.

It is evident from the two experiments so far made that collective contracting shows promise of partial solution of the problems of the industry. The Catamaran experiment points to the over-riding influence of markets upon the possibility of earnings,[23] but not to any weakness in the idea of collective contracting itself. Both experiments suggest the social value of *fuller collaboration in responsibility.* The Balmain experiment indicates, not that every cause of disunion either among the mine-workers themselves or between operative and managerial functions will be eliminated, but that even self-interest may be made to minister to the collective good.[24] Any extension of the plan on a wide scale would undoubtedly be opposed by intransigent class-conscious warriors in the ranks of the Miners' Federation, more particularly if success attends further experiments. But it is difficult to see how otherwise the workers collectively are safely to gain that experience in the handling of the business problem of costs which is a necessary prelude to the successful working of any heroic scheme of socialisation.

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[23] If a market could have been found for the "slack," it is considered, on good authority, that the rate of 20s. a ton would have paid the contracting mine-workers.

[24] "One of the outstanding advantages of this proposal, in my opinion, would be the elimination of the continual wrangling in the industry, not only between the parties, but among the employees themselves."—Hon. A. C. Willis, M.L.C., who fathered the proposal. "Sunday News," Sydney, 26th February, 1928.

(*c*) *Nationalisation.*

To enter upon a discussion of the merits and demerits of nationalisation as a social and economic doctrine would lead too far afield in a book of this kind. Yet in so far as coal mining in every country has invariably been chosen as an industry with which collectivism must be initially concerned in its progress, it is necessary briefly to discuss the possibilities offered by the nationalisation of coal in Australia.

Nationalisation, as it is ordinarily understood, implies the appropriation by the State of all the capital assets of an industry and the direct management of its affairs by substantially the same directive and operative force, now become State employees. It does not imply that the internal relations of men and management are vitally changed, nor that the ordinary business problems of the market are eliminated. It certainly does imply the elimination of competitive profit-making activities by unrelated units within the territory of the State and the substitution of an over-riding monopoly control of the home market. It implies, of course, much more which may or may not be relevant to our enquiry.

It is significant that in both the United States and Great Britain, where the full nationalisation of such transport services as the railways is not known as in Australia, the mine-workers' organisations have officially adopted the nationalisation of mines as an objective.[25] In Australia, on the other hand, the miners' organisation has never advocated this step, though the declared ultimate objective of the Australian Labour Party, with which the unions are organically linked, is "socialisation of the means of production and distribution." The fact is that, with the experience of nationalised railways before them, the miners in Australia can muster no enthusiasm for State ownership and management of the mines. They realise, as do most other critics, that national ownership and management give very little new help in the solution of difficulties between management and employees, nor do they necessarily add much to the pay-envelope of the operative.

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[25] In Great Britain at least a dozen variants of nationalisation have been presented from time to time. For a discussion of some of them, more particularly that of the Miners' Federation, put before the Royal Commission of 1925, see Lubin and Everett: "The British Coal Dilemma," Chapter XIII.

Nationalisation of coal mining has therefore few real friends to urge its claims in Australia to-day. But has it any merits which might commend it on economic grounds? If not offset by more than countervailing disadvantages, it would at least offer that unity of direction in mining exploitation which could produce a peremptory closing down of collieries unnecessary in the national interest. Presumably, to make the unified control nationally effective, the industry would need to be nationalised by the Commonwealth itself, not piecemeal by the States. This would not be without its grave difficulties in view of the heavy commitments of State moneys in coal enterprises which a national economy might suggest should be closed down. The financial adjustments involved would not be insuperable. The nation as a whole would either have to be prepared to face a heavy initial loss on jettisoned equipment or be prepared to let even the nationalised industry inherit, without power to eliminate, much of the embarrassment of over-capacity. Such cost would be altogether apart from and additional to the generous measure of compensation which could hardly be avoided in appropriating the mines from their present owners.

Doubts arise, however, as to the greater efficacy likely to accrue either in operating costs, in marketing procedure, or in industrial relations under a system of nationalisation. It is unlikely, for instance, that the mine-workers as a whole would be so seized with their social responsibilities to the State as to forgo the pressing of collective and individual demands, even farther than under private ownership.[26] The very machinery of Government enterprise ordinarily makes resistance to concessions by the management more difficult than in the private concern. It is improbable that a giant national undertaking responsible to Parliament would be completely watertight from political pressure inimical to managerial efficiency. Again, whatever virtue nationalisation might have in bringing order or more equitable distribution of remuneration to labour into the narrowly productive side of the industry, it is unlikely that State ownership and management in itself could contribute anything to the solution of the marketing problems.[27] It is equally improbable that the impersonalised relationships between State and employee, or the still personal relations between the colliery manager and men, or between the men themselves, would be one whit the better for nationalisation. The experiment of nationalisation at the present stage of popular understanding of economic necessities would be fraught with probably greater net disadvantages and embarrassments than are even being experienced in the disorderly conditions of the present.

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[26] Leading, e.g., to a costly disturbance of the best ratio of offhand and surface labour to the labour at the coal face.

(*d*) *A Consumers'-and-Producers' Corporation.*

A plan of no less heroic proportions, though possibly of greater workability, than nationalisation is the reconstruction of the entire industry into a joint stock corporation under the direction of coal consumers and colliery employees. As the idea has been offered as a serious contribution[28] to the solution of the problems of coal, both in the United Kingdom and the United States, its applicability to Australia is worth consideration.

"In its simplest terms the plan is a reduction of *laissez-faire* to the current necessities of the coal industry."[29]

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[27] Realisation of this fact has proved a big obstacle to the advocates of nationalisation of the British coal industry.

[28] First by Professor Henry Clay, of the University of Manchester, in a Memorandum to the British Coal Commission of 1919, and later in highly elaborated and modified form, by Mr. Walton H. Hamilton and Miss Helen K. Wright, in their volume, published in 1928 by the Macmillan Co., New York, for the Institute of Economics, entitled "A Way of Order for Bituminous Coal." Students of the whole coal question, who may be intrigued by the plan, should consult this book (which contains the Clay Scheme as an appendix) and its equally fascinating and provocative predecessor in the same series, "The Case of Bituminous Coal" (1926).

[29] "The strength of laissez-faire is its concept of a domain of individual activity, owing no allegiance to the sovereign state, orderly from within, an instrument of public welfare. This was its essence in days of old and is to-day its abiding value. Its weakness is a mistaking of an instrument for the ideal, and an identification of the competitive usages of petty trade with law and order in industry. The confusion, due to time and circumstances, is a passing incident. A sacrifice of the rule of competition is the price of a return to laissez-faire." Hamilton and Wright, op. cit., p. 256.

Its aim is to secure public control of the industry without bureaucracy of detailed administration by the State, and to build on "the abundant experience of joint-stock administration," with retention of "the use of profit *as an index* of efficiency and a check on inefficiency or waste," and abolition of profit *as a motive*.[30]

In briefest outline, the reorganisation may be pictured as follows: The coal industry as a whole is to be transformed from a number of competing enterprises into a single joint-stock corporation established under statutory powers to buy out all existing interests and to enjoy the exclusive right to sell coal. Basic to the structure of the Corporation is the sharp separation of control from capital ownership. "Investment is to be represented by debentures which entitle their owners to interest, but deny to them any participation in the direction of the industry. Control is to be represented by shares in common stock, which entitle their various classes of holders to participate in their several ways in the direction of the enterprise, but deny to them any right to dividends."[31] The former owners of mining investments will receive transferable debentures bearing interest at 5 per cent. as the equivalent of their equity in the industry. The market value of these debentures will move above or below par according to the fortunes of the industry, and will be listed on the Stock Exchanges. Additional capital needed by the Corporation will be raised by further issues of this debenture stock.

In the Clay scheme the ordinary stock will be vested in consumers' and mine-workers' organisations in two equal blocks, carry exclusive voting power, be transferable, and earn residual profit for the holder after payment of debenture interest. In the Hamilton and Wright plan, however, the organisations which have the formal direction of the industry are to be issued with an aggregate of 154 non-dividend paying, non-transferable shares divided into two classes. An equal division of the 110 shares, each worth a vote on the directorate, in the first class will be made between (1) trade associations or other bodies representative of industrial consumers or of exporters and domestic consumers[32] (for whom the official head of the State will be trustee), and (2) the mine-workers' organisations, the allocation of each share under (1) being made according to coal consumed. The 44 shares of the second class, which carry a right to participation in direction but no vote, will be allocated "in trust to a body composed of all the administrative and technical officials of the industry."[33]

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[30] Professor Clay.
[31] Hamilton and Wright, op. cit., pp. 168-169.

The American scheme further provides that representation on the Board of Directors will be by way of one seat for each of eleven blocks of shares. Thus the groups of consumers and mine-workers will each have five seats representative of a distribution of fifty-five votes among the electing parties in each group, and the technical officials four seats with no votes. "A directorate of fifteen is completed by the addition of a chairman, who is to be the president of the company, selected by the directors from without their number. He, likewise, is to participate in its deliberations and is to have no vote in its formal decision."[34]

As to the general functions of the Corporation, they may best be summarised in the words of the American authors:

> "The board of directors is the supreme authority in the industry. It is to perform such offices as an actual directorate might perform in a well-run and independent corporation. It is to select such general officials as are necessary. It is to divide the industry into districts and as occasion demands change these lines of division. It is to fix the requirements of competence for superintendents, managers, technical experts, engineers, foremen, miners, and for all functionaries, of high or low estate. It is to establish minimum stan-

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[32] Professor Clay would include the Co-operative Wholesale Society and individual co-operative societies among trade associations and have domestic consumers, to the extent for which they are not so provided, represented by city, borough and district councils.

[33] Hamilton and Wright, op. cit., p. 171.

[34] Hamilton and Wright, op. cit., pp. 172-173.

dards of technical excellence for the types of equipment, for classes of activities, and for mine administration. It is to regulate the general conditions under which labourers are to be employed and under which work of all kinds is to be done in the coal mines. It is to articulate the various workings into an orderly coal industry, formulate policies for its development, and to control all extensions and limitations of capacity. For the year ahead, it is to estimate the consumption of coal, draw up a coal budget, and allocate the national requirements among the several districts. It is to fix all rates of wages, and the prices of all coals."[35]

The propounders of the American scheme make no claim that such corporate control would represent an industrial Utopia at work or provide a panacea for all the ills of coal; but they do affirm the probability of its giving more reasonable performance than other alternatives in reorganisation. Yet the inauguration and maintenance of such a novel reconstitution of the tradition-bound coal industry present large problems of a general kind[36] and particular difficulties of application to Australian conditions. Among the former are to be placed the inaugural tasks of valuing properties (or, rather, equities, for many and varied are the interests in coal and its connections which would have to be surrendered) and compensating existing holders of legal rights in the industry. The statutory separation of control from investment is, indeed, not as radical a step as it appears; for, although it may infringe the "golden rule of capitalism"[37] that where monetary risk lies there also must lie control, such separation merely gives a legal impetus to the prevailing tendency in large joint-stock enterprise of to-day for the great body of investors to be divorced from actual control of industry. The ordinary investor is, in fact, no more than the seller of a necessary raw material of industry.[38] The real danger lies, however, in transforming this *de facto* situation in the coal industry in Australia, or anywhere else, into a situation *de jure* by a sudden legal process which involves compensation. It would be difficult to avoid saddling the industry itself with capitalisation values and perpetual debenture payments thereon big enough to frustrate subsequent efforts at price reduction of coal and resuscitation of trade.[39]

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[35] Ibid, pp. 173-174.

[36] Discussed at length by the American authors and two of their colleagues of the staff of the Institute of Economics. Op. cit., Chapter X. and Appendix A.

[37] D. H. Robertson: "The Control of Industry" (Cambridge University Press), p. 89.

The very structure of the suggested Corporation raises the question of workability. Assuming the possibility of a Corporation inclusive of coal operations throughout the whole Commonwealth, it would be necessary to discover or create organisations of industrial coal-consumers both inside and outside of Australia, to which representation on the directorate is to be assigned. Representation for a large part of internal industrial consumption might be secured through the various sections of the associated Chambers of Manufactures in each State, but many non-member industrial concerns, whose aggregate consumption is considerable, would thus be excluded from voice in the election of directors. The securing of representation of the several State railway administrations would be complicated by the fact that in New South Wales, Victoria and Queensland, a very large part of their coal requirements are drawn from State-owned mines, the absorption of which in a comprehensive Corporation would probably be strongly resisted. It is arguable that overseas buyers[40] should be excluded from representation in the direction of the industry altogether, in which case it would be left to the mine-workers' and technicians' representatives to give disinterested attention to the fostering of overseas exports. Representation of the mine-workers in itself would be relatively simple to arrange, but that of the various grades and classes of administrative and technical officials (who have little or no organisation) would present real difficulties. It is, further, by no means certain that representatives generally would not in course of time degenerate into delegates. Knowledge of the industry and capacity to frame policy for a giant enterprise would by no means be assured by election on the representative principle. Moreover, the scheme works on the assumption that manual workers', administrators', technicians' and consumers' interests will merge. One sees rather a continuous conflict of interests on the directorate more real than the brushes which occasionally ruffle the calm of a board meeting of an ordinary joint stock company. One can descry party division as heated as any in a municipal assembly of aldermen.

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[38] A doctrine enunciated by the late Lord Leverhulme. "The shareholder in the large aggregations of capital that are known to-day is no longer a partner: he is merely an investor—a money-lender." ("The Six-Hour Day," Allen and Unwin, London, p. 77.) The same doctrine underlies the Godart Act (1917) in France and the Companies Empowering Act (1925) in New Zealand (The Valder Scheme), which provide for the legal issue of "labour shares" with no capital value, non-transferable though dividend-bearing, to those who render the "active service of labour" directly in a business, solely by virtue of their labour, with the passive investors merely as interest-receivers or as residual claimants to surplus profits.

[39] "The tendency will inevitably be, in a hurried appraisal, to give the individual owner the benefit of the doubt, so that the capitalized value will work out somewhat heavier than actual present values."—C. O. Hardy, Appendix A, p. 318, of "A Way of Order for Bituminous Coal."

[40] Who absorbed between 12 and 13 per cent. of the total Commonwealth production of coal in 1927.

It is the joint task of the director-representatives to be engaged in "a continuous process of policy making"[41] in respect both of prices and wages. "Underlying the whole structure will be the fundamental notion of a single price"[42] based on the average costs of production of a few convenient classes of coal. This conception of price determination would present no novelty in Australia, where the exercise of monopoly power referred to earlier in this book has accustomed purchasers to an absence of resilience in the prices of the various standard coals. But the transference of wage fixation from the existing machinery of independent tribunals to a board of director-representatives themselves controlling the industry is something entirely foreign to the traditional attitudes to the wage question in Australia. Experience suggests, for one thing, that it would be extremely difficult to get the mass of mine-workers to accept the assurance even of their own representatives on the directorate that at any time the maximum economic wage was being paid.

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41. Hamilton and Wright, op. cit., p. 207.
42. Ibid, p. 218.

The probable splitting of interests among the directors suggests that the arbitral functions of the independent chairman would become substantially those of the Chairman of the existing Coal Tribunal. Impasse would probably be no less likely than under present conditions, whilst a strike under the direction of the Miners' Federation would probably wreck the whole corporative scheme.

Looked at in broad outline, a reorganisation of the entire coal industry of a country on such a corporative model suggests a unification of policy possibly serviceable to the community at large and to the several special interests concerned most directly with coal. It might for Australia mean a more thorough-going conservation of coal resources, greater orderliness as the result of a direct attack upon the problem of over-capacity, and a recovery of export sales at the hands of a large organisation bent on popularising Australian coal on overseas markets. But even if there were no doubt that these desirable economic ends could be achieved along the lines suggested, there would first be major legal obstacles to overcome in Australia. A Corporation might legally be instituted in New South Wales to embrace in its directorate representatives of mine-workers and technicians in that State alone and consumers in all States, but such an organisation would clearly be hampered in its efforts to "rationalise" coal production in Australia as a whole. The only likely but very real obstacles to a nation-wide Corporation under the New South Wales law would be objections of the producers of that State. On the other hand, in view of the High Court's interpretation in 1908[43] of the Commonwealth's Constitutional powers, it is improbable that anything less than an amendment of the Constitution, a very unlikely prospect in view of previous attempts to secure the necessary approval by way of a national referendum, would make possible the creation of a Corporation under Commonwealth law. However far arguments may be multiplied both for and against this corporative plan, it does not appear commendable as the next step in the reorganisation of the coal industry in Australia.

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[43] Huddart Parker v. Moorehead (1908, 8, C.L.R 330. The five judges who dealt with this case agreed that the Constitution did not enable the Commonwealth "to create or provide for the creation of a corporation."—Sir R. R. Garran, in evidence before Royal Commission on the Constitution of the Commonwealth, 22nd September, 1927. The decision left utterly vague the Commonwealth's powers in respect of corporations already existing under State laws.

(*e*) *Socialisation.*

Of the promise of "socialisation" as a means to the curing of the ills of the coal and every other industry little can be said. For no definition of a millennial hope can project a picture in which concreteness of outline or detail can be examined. If "socialisation" is not to be identified with nationalisation and its disillusionments, in what important essentials does it differ?

Presumably above all else it implies regenerated forms of democratic control at all points in determination of policy in the administration of an industry, with the retention but subordination of the freedom of the technical expert in matters of practice. Just how this happy combination is to be achieved is an imaginative exercise for the intellectual rather than a proposition capable of demonstration. Syndicalist, guild socialist and general Marxian literature is abundant in speculation on the possibilities of the new man who is to be evolved in the achievement of socialised endeavour. It may be that the existing organisation of industry does not allow the burgeoning of the fairest fruits of human co-operation, but it is pure hypothesis that structural changes in the organisation and control of an industry will subordinate individual and group wills and interests to the wider collective good.

It is very much open to question, then, whether socialisation in the form of syndicalist, guild socialist or any other structure of the coal industry in Australia would eliminate those main causes of dissidence in human relations which tend to make the existing order imperfectly workable. A socialised control could in effect mean little else in terms of economic realities than a nationalised control, and might offer the same advantages and possibly worse disadvantages. Even the most class-conscious critics of capitalistic enterprise in executive positions in the Miners' Federation question the miners' present ability satisfactorily to run the industry with democratic machinery. It is undoubtedly realised, though never publicly confessed, that factional and personal objectives would endanger the economic working of a socialised or syndicalised control. Yet there is no question that the miners' leaders and many of the rank and file will continue to nurse the millenial dream of socialisation in some form or another and of a body of workmen fitted by education and a regenerate outlook for the great responsibilities involved. Even such an inspiring "myth" (in the phrase of the one-time syndicalist philosopher Sorel) is of greater social worth than the self-regarding ideals whose practical fruits are irresponsibility and greed.

IV. A Suggested Experimental Solution.

The several roads of approach to the longer-range solution of the problems of coal so far examined are none of them without more or less serious limitations, though some are suggestive of possibilities for good. It is in the nature of the complex problem which the industry is facing that this should be so. There can be no single or simple solution of the problem, but only a welding of diverse elements into a workable plan of attack.

The situation is essentially that the Australian coal industry and all concerned in it are to-day being squeezed between the upper mill-stone of a relative decline in demand and the nether mill-stone of over capacity. All remedies that are remedies must be related to these two unpleasant facts. They must strike at the source of over-capacity and do what they can to help coal to be more than a match for its substitutes. A policy of price deflation over a period of years, not so much a sudden drop, may recover the loyalty of the users of substitutes; that is, of course, if reversion to Australian coal will clearly pay them. But the much more important need, if the industry is to give a reasonable performance and meet reasonable expectations of profits, wages and prices, is to reduce the over-capacity. Such a reduction would cast off a great deal of the load of real overhead for which the whole community pays.

How may this be done in a programme which may be spread, not over one year, but over a period of years? There are conceivably a number of schemes that could be made workable, but none of them will be painless, either to owners or mine-workers. There is probably no immediate form of relief adequate to the existing situation. But the suggested approach to the problem with which this book will finish carries at least the promise of a healthier condition for the industry within four or five years.

Group amalgamation among those collieries whose costs per ton at present are lowest should not prove insuperable when identity of interest points to inevitable advantage. Such mergers, with drastic writing down of capital values, have been the self-imposed, if disagreeable, course of numerous British and German coal concerns since 1924. If the consequences are economies which lower the cost per ton, prices should be reducible to a point low enough to divert to the amalgamations some portion of the tonnage custom now going to the less economically run mines. That will tend to employ the better situated, equipped and managed mines of the amalgamations to a full capacity and reduce the overhead per ton for all their coal mined. Even if such economies will not directly reduce the costs represented by the wages bill, they should tend to establish costs of production and therefore selling prices at a somewhat lower level, and increase the proportion of the market obtainable by the amalgamations.

Of course, such a scheme would mean a readjustment of interests among all the collieries at present associated to maintain existing declared prices. The present (1929) level of prices is keeping in existence many part-time mines which should be no-time mines, those which have either fallen back in the contest for efficiency under the admittedly difficult conditions created by labour costs, or which have really been born before their time. Amalgamations of the more fit to survive need not be expected immediately to squeeze out the less fit, but they will hasten a process which is altogether too slow in coal mining. If unnecessary mines persist, it is not by any means the main fault of the mine-workers that the costs represented by their aggregate wages, due to a surplus of at last 5000 workers, is an uneconomic load on the industry. Every mine is a more or less isolated labour market. Cut down the number and organise the rest on some closer approximation to unified control, and decasualisation of the miner's work and reduction of the surplus must follow.

The squeezing out of some 5000 mine-workers from their craft is, in a scheme of deflation, probably a sufficient price for the workers in the industry as a whole to pay. Their absorption in other industrial activities becomes a separate but not insuperable problem. Both they and the losing investor have, however, some equity in the industry which should be recognised, and should be given some compensation. They depart that others may remain in greater comfort. The compensation should therefore be met by those who gain by their departure; in other words, should be the triple responsibility of the remaining colliery proprietors, the remaining mine-workers, and the community at large.

Negotiations for the suggested amalgamations could begin immediately. Meanwhile, certainly no more mining leases should be granted by State Governments. Obviously the initiative in the process of amalgamation should be taken in New South Wales. At the end of, say, two years a system of Government licensing of collieries through a Licensing Court might be introduced either by Commonwealth or State, and a Coal Licence Reduction Board be established, with powers not unlike those exercised by the Licences Reduction Board under the New South Wales Licensing Amendment Act, 1923, for the control of the hotel business. A modification of the compensation arrangements obtaining in the liquor trade, that is, a fund to which coal licensees, mine-workers and consumers contribute, should not be unworkable. Such contributions might be regarded as a betterment tax.

Obviously such a tax must be reflected, as far as the direct consumers' contribution is concerned, in the price of coal. Equally obviously, unless Government pay it directly from the Treasury, and thus relieve the coal consumer as such of a direct contribution, it should be so spread over a period of years that its incidence upon price is far less than the incidence of the existing load of overhead. A main contribution of Government to the ordering of the industry might be the advance of a loan to a fund for the speedy adjustment of compensation claims by the Licensing Board, and, on appeal, by the Licensing Court, such fund being reimbursed over a long period from the contributions of the three parties paying the betterment tax. It is equally clear that the compensation paid to investors in collieries closed and to mine-workers excluded should in each case be a *solatium* rather than a *quid pro quo* for their full losses.

Such an arrangement would strike at the over-development of mining in New South Wales. But preferably the licensing of mines should be a Commonwealth matter, because of the irregular and over-fast development given to the industry by the uneven distribution of Australian coal resources. A Commonwealth Board and Court could bring comparative tests to bear on all the claims of mining enterprises in all States as to their capacity adequately to supply local, as well as distant, markets at a competitive price. Perhaps constitutional difficulties in the way of Commonwealth machinery would be insuperable. But that is a matter for constitutional lawyers, not for the economist, to determine, and the people can amend the Constitution if they will. A greater practical difficulty, no doubt, would be the opposition of mining interests in other States than New South Wales. In so far, however, as New South Wales mines possess the best grades of coals and determine the basic costs against which the possibilities of successful mining are measured in other States, action covering the mother State alone might be sufficient to bring coal-mining capacity within the Commonwealth into reasonably steady relationship with the people's coal-consuming capacity.

EPILOGUE.

Whatever the line of attack eventually chosen for the rehabilitation of this great national industry, it is clear from all that is involved in the economics of coal that it must proceed from the deliberate taking of patient and careful thought which leaves no essential element out of account, and which assumes a faith in the capacity of all concerned in coal even more for self-mastery than for self-service. This implies capacity as much for the surrender of outworn prejudices of mind and feeling as it may for the temporary surrender of economic advantages. Men, says Professor A. Lawrence Lowell, "can unite for action only by the sacrifice of a portion of their ideas."[44] "When we speak about the solution of a problem in the Great Society," says Walter Lippmann,[45] "we may mean little more than that two conflicting interests have found a *modus vivendi.*" And if the "economic motive," again to quote sage American thought,[46] "like all tempestuous and elemental things, is unpurposive and untamed," nothing less than its subjugation to higher social motives will rid our industrial and commercial life of its crudities. Such higher purposive motives may be developed in every man. But, only in the measure that they are consciously disentangled from the self-regarding motives and allowed to assume supremacy, will their operation minister to the re-ordering of industry.

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[44] "Public Opinion and Popular Government," p. 61.

[45] "The Phantom Public," p. 98.

[46] Hamilton and Wright: "A Way of Order for Bituminous Coal," p. 268.

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